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Indian Industrial Commission

1916—18

REPORT



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INDIAN INDUSTRIAL COMMISSION 1916-18

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INTRODUCTORY.

Appointment and constitution of the Commission.

The Indian Industrial Commission was appointed by the Government of India by order conveyed in Resolution No. 3403 (Industries), dated the 19th May 1916, in the Department of Commerce and Industry, the full text of which is reproduced as Appendix A-1. The Commission was "instructed to examine and report upon the possibilities of further industrial development in India and to submit its recommendations with special reference to the following questions :—

"(*a*) whether new openings for the profitable employment of Indian capital in commerce and industry can be indicated ;

(*b*) whether and, if so, in what manner, Government can usefully give direct encouragement to industrial development—

(*i*) by rendering technical advice more freely available ;

(*ii*) by the demonstration of the practical possibility on a commercial scale of particular industries ;

(*iii*) by affording, directly or indirectly, financial assistance to industrial enterprises ; or

(*iv*) by any other means which are not incompatible with the existing fiscal policy of the Government of India."

In addition to the exclusion of the tariff question from the scope of the Commission's enquiries, it was also stated to be unnecessary for it to undertake the examination of those aspects of technical and industrial education which had recently been dealt with by the Atkinson-Dawson Committee, appointed in 1912 to enquire into the means of bringing technical institutions into closer touch with employers of labour in India, and by the Morison Committee which reported to the Secretary of State in 1913 on the system of State technical scholarships established by the Government of India in 1904.

The Commission was composed of the following Members :—

(1) Sir T. H. Holland, K.C.I.E., D.Sc., F.R.S., President of the Institution of Mining Engineers. (President.)

(2) Mr. Alfred Chatterton, C.I.E., B.Sc., F.C.G.I., A.M.I.C.E., M.I.M.E., Director of Industries and Commerce in Mysore.

(3) The Hon'ble Sir Fazulbhoy Currimbhoy Ebrahim, Kt., Messrs. Currimbhoy Ebrahim and Company, Bombay.

(4) Mr. Edward Hopkinson, M.A., D.Sc., M.I.C.E., M.I.M.E., M.I.E.E., Managing Director, Messrs. Mather and Platt, Ltd., Manchester, and Vice-Chairman, Chloride Electric Storage, Ltd.

(5) The Hon'ble Mr. C. E. Low, C.I.E., I.C.S., Secretary to the Government of India, Department of Commerce and Industry.

(6) The Hon'ble Pandit Madan Mohan Malaviya, B.A., LL.B., of Allahabad.

(7) The Hon'ble Sir Rajendra Nath Mookerjee, K.C.I.E., Messrs. Martin and Company, Calcutta.

(8) The Right Hon'ble Sir Horace Curzon Plunkett, P.C., D.C.L., LL.D., F.R.S., K.C.V.O.

(9) The Hon'ble Sir F. H. Stewart, Kt., M.A., C.I.E., Messrs. Gladstone, Wyllie and Company, Calcutta, President, Bengal Chamber of Commerce.

(10) Sir Dorabji Jamsetji Tata, Kt., J.P., Messrs. Tata, Sons and Company, Bombay.

Secretary.—Mr. R. D. Bell, I.C.S.

Unfortunately Sir Horace Plunkett was unable to join the Commission, owing at first to ill-health and subsequently to other duties of high national importance. Dr. Hopkinson submitted his resignation during the second season's tour, having been debarred under medical advice from coming out to India in November 1917, though during the first year we received great assistance from the advice which his range of experience both as a manufacturer and as a scientist enabled him to furnish. In October 1917, Mr. G. H. W. Davies, I.C.S., was appointed Joint Secretary, as Mr. Bell, whose services had some months previously been transferred to the Indian Munitions Board, could not be spared for the forthcoming tour, though he continued to assist the Commission by supplying information on various points and afterwards in the preparation of the report.

Monsoon tour of the President.

It was arranged that the President should come to India some months before the Commission assembled, in order to acquaint himself with the existing industrial position. He arrived in India in May 1916 and proceeded to Simla; whence, after making preliminary investigations, he started on tour at the end of June and visited Bengal, Bihar and Orissa, Madras, Bangalore, Bombay, the Central Provinces and the United Provinces, returning to Simla towards the end of September. The scattered information available was marshalled in the form of a preliminary note by the President on the scope of the Commission's enquiry, and placed before the Members at a meeting held in Calcutta in July 1916, when the methods of procedure to be adopted in the formal collection of evidence were discussed and decided. This note is printed as Appendix A-2.

Preparation of a list of questions.

At the end of September 1916 we assembled at Simla and prepared a list of questions covering, as far as possible, the scope of the Commission's enquiry, in order to assist witnesses in focussing their attention on those parts of it of which they had special knowledge, or in which

they were specially interested. This list, as subsequently revised. consisted of 113 questions under 10 main heads (*vide* Appendix A-3).

Methods of enquiry.

Our enquiry included the personal inspection of industrial enterprises, the examination of witnesses, and discussions with representatives of local committees and institutions. We had also the advantage of conferring with the Provincial Industrial Committees which existed in some provinces and with some of the Local Governments and Administrations. In all we recorded the written statements of 472 witnesses, and 342 appeared before us for oral examination.* In deference to the wishes of witnesses or from other considerations, it was considered advisable to treat as confidential some of the matter brought before us, and we have accordingly prepared one volume of confidential evidence, which will not be available to the general public. In view of the fact that the Commission was freely admitted to inspect industrial concerns, and that information, often of a confidential nature, was placed at our disposal on these occasions, our inspection notes also will not be published.

Tour of 1916-17.

We met at Delhi on the 26th October 1916, with the exception of Mr. Low who joined the Commission at Bankipore, and, after taking evidence in the Delhi Province, we visited the United Provinces, Bihar and Orissa, Bengal, the Central Provinces, Madras and Bangalore. Details of our itinerary with a list of institutions visited are given in Appendix A-4. In January 1917, in consequence of the increased difficulties of obtaining from Europe stores for war and essential purposes, the necessity of stimulating the local manufacture of munitions became a matter of vital importance. Taking advantage of the experience already gained by the Commission, the Government of India summoned Sir Thomas Holland to Delhi at the end of the month and requested him to organise a new department for the purpose. This decision—although the resulting organisation was in its final form precipitated by the conditions developed during the war—was welcomed by us as a practical anticipation of many of the conclusions which had been forced upon us by evidence that began to repeat itself most strikingly before we reached Madras. For the newly formed Indian Munitions Board, as the central authority controlling the purchase and manufacture of Government stores and munitions of war, became, in effect, an experiment on a large scale designed to test the value of many of our conclusions regarding not only the manufacturing capabilities of the country, but also regarding the kind of administrative machinery most suitable to carry out our proposals. The Munitions Board is thus our principal witness,

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* The evidence is printed in six volumes :—

Volume I. Delhi, United Provinces and Bihar and Orissa.
Volume II. Bengal and Central Provinces.
Volume III. Madras and Bangalore.
Volume IV. Bombay.
Volume V. Punjab, Assam, Burma and General.
Volume VI. Confidential.

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and we have had the benefit of information regarding some of its activities. After the departure of Sir Thomas Holland from Madras, Sir Francis Stewart acted as President for the remainder of our visit to Southern India. On the conclusion of the tour Messrs. Low, Chatterton and Bell assembled at the office of the Munitions Board to summarise the results of the first year's enquiries.

Tour of 1917-18.

When the Commission re-assembled on the 7th of November 1917, Sir Thomas Holland rejoined and presided over our enquiries in the Bombay Presidency. Pandit Madan Mohan Malaviya was unable to take part in our sessions at Bombay, but accompanied us for a portion of the ensuing Punjab tour. Mr. Chatterton was compelled to be absent during our tour in this province. The Commission afterwards visited Assam and Burma. Pandit Madan Mohan Malaviya, Sir Fazulbhoy Currimbhoy and Sir D. J. Tata were unable to take part in the Assam tour, and the two former were also prevented from visiting Burma. As the President had to revert to his duties with the Munitions Board after the Bombay tour and was only able to join us for special discussions on one or two subsequent occasions, Sir R. N. Mookerjee was appointed to act as President of the Commission until its re-assembly at Simla for the preparation of the final report.

During the tour the personnel of the Commission was strengthened by the inclusion of an officer with local knowledge in each province, nominated by the Local Government to help in our enquiries, and coopted by the Commission. The following gentlemen, to whom our thanks for their ready help are due, assisted in our proceedings :—

(1) Mr. G. A. Thomas, I.C.S., Secretary to Government, Bombay.

(2) The Hon'ble Mr. H. J. Maynard, C.S.I., I.C.S., Financial Commissioner, Punjab.

(3) The Hon'ble Lieutenant-Colonel P. R. T. Gurdon, C.S.I., I.A., Commissioner, Assam Valley Districts, Assam.

(4) The Hon'ble Mr. H. Thompson, C.S.I., I.C.S., Financial Commissioner, Burma.

Scope of enquiry.

In conducting our enquiries and even more so in drafting our report, we found it impossible to treat at length all the very numerous questions involved; and we were compelled to dismiss somewhat briefly many subjects of importance, in order to avoid loading our report with a mass of detail which would have delayed its issue very seriously, while not adding materially to its practical usefulness.

Moreover, although much information of technical and industrial value will be found in the evidence of some of the expert witnesses, our report is not intended as an industrial survey of India, and we have, therefore, concentrated our attention on the machinery which we propose should be set up to effect industrial development generally, rather than on the particulars industrie to be improved. This machi-

nery will, we believe, do what is needed for all industries, and it would be useless for us to attempt to frame detailed recommendations for which technical enquiries by experts are required. We have carefully studied the position of certain important industries and the proposals which have been made for their improvement; but we have used the knowledge so obtained as a basis for our recommendations for the technical and administrative equipment which Government will require and for the financial facilities it should provide. In a few cases, however, when we deemed an industry of sufficient importance to deserve special treatment, we have had notes prepared in greater detail: these will be found as appendices. We have dealt at length with the important questions of the organisation of the scientific and administrative services, with technical education and industrial finance; and have, we hope, worked out a scheme which will enable Government to keep in touch with, and assist, industries of all classes, whether domestic or organised. But the reader must not expect to find in this report the practical information which would enable a particular undertaking to be started; such, for instance, as would be furnished by an expert when reporting on the prospects of a proposed industry. Still less must he regard it as an industrial *vade mecum* to guide him by short cuts to fortune. Even had we attempted to describe the general principles determining the success or failure of any particular industry, this would still be of no use to the would-be industrialist, without knowledge of local details regarding the supplies of raw material, the markets for the finished article, and the cost of labour, information which it would be impossible to give in a report of this nature. We hope, however, that in the imperial and provincial Departments of Industries, when in working order, will be found an organisation for collecting such information.

Effect of the war on public opinion regarding industrial matters.

We feel it necessary to refer to the considerable change in public opinion regarding industrial questions brought about by the war, a change which we also see reflected clearly in the policy of Government. We have explained in our report the deadening effect produced by Lord Morley's dictum of 1910 on the initial attempts made by Government for the improvement of industries; but a change of sentiment was gradually coming about, and a considerable step in advance was marked by the appointment of our Commission, with liberty to discuss the question of the direct participation of Government in the industrial development of the country. Since then, the views of Government and of the public have been further modified under the stress of war necessities, which have led to a still more definite adoption of the policy of State participation in industrial development, and to the grant of State assistance to several industrial undertakings, of which the scope is not in every case limited by the possible duration of the present war. The working of the Indian Munitions Board has shown several examples of this policy, and we trust that care will be taken to preserve such features of this organisation as are properly adaptable to peace conditions. We desire here to refer to the

extent to which the action taken by Government and private industrialists under conditions created by the war has assisted us, by furnishing actual examples of schemes which we had been contemplating: though some of our conclusions have thus been forestalled, we have been enabled to present them with more certainty and completeness. Finally, we may claim that the public discussions called forth by the activities of our Commission and the evidence taken by it have also borne their part in this movement, and have led to proposals being put forward or action being taken by Local Governments for the improvement of technical education, the employment of experts, the creation of official organisations, and assistance to individual industries which clearly evidence the widespread desire for progress in the direction indicated in our report.

Acknowledgements of assistance.

It is our pleasant duty gratefully to acknowledge the generous assistance and hospitality which we received from officials and non-officials throughout the course of our work. We wish in particular to record our sense of the help which we received from representatives of the numerous industrial firms to whom we applied for advice and information. We derived much encouragement from their readiness to place at our disposal the results of their valuable experience. We desire also to express our thanks to the Local Governments and Administrations for their cordial co-operation in our enquiries.

We have now only to place on record our appreciation of the services of Mr. R. D. Bell, I.C.S., our Secretary, and of Mr. G. H. W. Davies, I.C.S., who joined us as Joint Secretary in October 1917. The former rendered valuable assistance in working out the detailed lines on which we subsequently conducted our work; and his service with the Indian Munitions Board gave him most useful experience which was freely placed at our disposal. Mr. Davies, who had previously acted as Secretary to the Bengal Provincial Industries Committee, lightened our labours materially by his willing help.

CHAPTER I.

Rural India, Past and Present.

Relative industrial backwardness of India : its causes.

1. At a time when the west of Europe, the birthplace of the modern industrial system, was inhabited by uncivilised tribes, India was famous for the wealth of her rulers and for the high artistic skill of her craftsmen. And, even at a much later period, when merchant adventurers from the West made their first appearance in India, the industrial development of this country was, at any rate, not inferior to that of the more advanced European nations. In both, industries had for long been protected and controlled by somewhat similar systems, the gilds of Europe fulfilling in this respect much the same functions as the Indian castes. But the widely different social and political conditions of the West had helped the middle class to establish itself on a foundation of commercial prosperity, and the struggles for political and religious liberty in which it had taken its share ha dendowed it with a spirit of enquiry and enterprise, that was gradually and increasingly directed to the attainment of industrial efficiency. It was to this middle class, that the so-called "industrial revolution" of the eighteenth century was mostly due. This revolution was only the culmination of a long series of attempts to utilise in the most profitable way the natural resources available. But even at this time progress was by the slow methods of "trial and error," and the knowledge of scientific laws was in an elementary stage throughout the period when the most striking industrial advances were being made.

2. The East India Company, whose agents first set foot in India at a time when the earliest beginnings of the great industrial movement were making their appearance in the west, was primarily a trading corporation, whose rôle was to exchange as far as possible the manufactured goods of England for the products of India. Whether these products were raw or manufactured was not a matter of vital importance to the success of its trading operations, which was not seriously affected by the exclusion at one time of Indian silk and cotton goods, brought about by the jealousy of British manufacturers. Attempts were frequently made throughout the period of its domination, and even subsequently, to introduce into India various manufactures with State support and encouragement; but in the absence of scientific knowledge, such experts as were then available were unable successfully to adapt the results of western experience to Indian conditions, and most of the enterprises ended in failure, perhaps the best-known instance being

the iron works of southern India. These failures strenghthened the erroneous idea that tropical countries, with their naturally fertile lands and trying climate, were suited to the production of raw materials rather than to manufactures. The growing success of the textile industry did little at first to dispel this view, and, as the doctrine of *laissez-faire* established itself, gave further force to the theory that Government was ill-qualified to further industrial development by direct action, and that all such matters should be left to private enterprise. The efforts of the State were concentrated on the improvement of communications and on facilitating the flow of trade, which continued, under the conditions above described, to consist mainly of exports of Indian raw material and imports of foreign manufactured products. But the feeling which gradually arose among thoughtful men in India, that the existing conditions were unsatisfactory and were even inimical to national development, was well founded; and, accentuated by the growing pressure of foreign competition, and latterly by the stress of a terrible war, has culminated in a universal demand for a complete industrial system on western lines.

A more detailed account, however, of the economic position is necessary for a clear understanding of the complex factors which must be taken into account before framing a remedial policy.

India before railways.

3. The coming of the railway and the steamship, the opening of the Suez Canal, and the extension of peace and security by the growth of the British power have brought about very great changes. In earlier times every village not only grew most of its food, but either provided from its own resources or obtained from close at hand its few simple wants. Its cloth, and often the raw material for it, its sugar, its dyes, its oil for food or lighting, its household vessels, and agricultural implements, were manufactured or produced either by the cultivator himself, or by the village craftsmen, who were members of the village community and were remunerated by a share of its produce. Money for the payment of the Government dues and for the purchase of metals or of luxuries was found by the sale of surplus food-grains or of agricultural and forest products required by neighbouring villages. These exchanges were effected and financed by the country traders, who were found mostly at the large villages or small towns that formed the centres of a series of economic circles, the radius of each of which was measured by the distance to which the few local imports and exports could be profitably carried.

The above is a fair description of the country as a whole; but there were not wanting other and larger centres of trade, situated on the few recognised routes of land transport, on navigable rivers, or on the sea-coast, where a market existed for the articles to which their rarity or costliness lent sufficient value to offset the expense of carriage from a distance. These were few, for communications were difficult and insecure. Precious metals, artistic manufactures, and a few rare drugs and dyes made up the bulk of this traffic, which was mainly directed to the ports from which trade with foreign countries was carried on,

or to military and administrative centres. The courts of Indian rulers had always attracted to themselves the surplus grain of the country-side to feed the armies, officers, and dependents of the Chief. These and the traders and artificers who supplied their needs, made up the population of an old Indian capital. From an industrial point of view, the most interesting section of this population was the class of artisans who were engaged in producing not only arms and leather accoutrements, but rich textile fabrics, carved stone, wood and ivory, wrought metal, jewellery, and other articles of luxury, often of exquisite workmanship and high artistic value. Even to-day, the famous centres for the production of Indian artwares are the old capital towns. The earnings and social position of such craftsmen were, in times gone by, out of all proportion to those of the less skilled workers in the villages or small towns.

4. The ports were hardly less numerous, though far smaller than to-day; it will be clear from the account already given, that their trade was only in the rarer and more valuable articles and in commodities such as spices, of which India possessed a complete or partial monopoly. It was further restricted in the case of the western ports by the formidable barrier of the Ghats, with the result that all but the most portable and valuable exports were drawn from the comparatively small area between them and the sea. The foreign traders who were settled at these ports, with a few agencies located along the various trade routes which supplied them, not only collected these articles, but took an increasing share in the finance and organisation of their production.

We have now to see in what ways this state of affairs has been modified by outside influences.

Effect of Exports.

Economic changes in rural areas.

5. Turning in the first place to the rural areas, we find an increasing degree of local specialisation in particular crops, especially in those grown for export. Cotton is now no longer planted in small patches in almost every village where conditions are not absolutely prohibitive, but is concentrated in areas which are specially adapted to its various types. The dry plains of central and western India are admirably suited to a short-stapled but prolific kind; while the canal fed zones of the Punjab, the United Provinces, and Sind are producing an increasing quantity of longer-stapled types, which are also grown in the retentive soil and moister climate of Gujerat and in the well-irrigated areas in Madras. The peculiarly favourable climate of Bengal has tempted the ryots to extend their jute cultivation, often at the expense of their foodstuffs, while sugarcane is disappearing from tracts not specially suited for it. A visible sign of this movement may be seen in the abandoned stone cane mills lying near villages in the arid plains of Central India, which now prefer to keep their scanty stores of water for other crops and pay for their sugar by the sale of their cotton. The

people have been led to make this change by the cheap railway and steamer transport and by the construction of roads, which, while facilitating the introduction of foreign imports, also render available to the farmer in his distant and land-locked village a large share of the price offered by far-off nations for articles which once merely supplied the needs of Indian rural life. Markets have sprung up on or near the railway, where the foreign exporters or the larger Indian collecting firms have their agencies; and the ryot is now not far behindhand in his knowledge of the fluctuations in the world-prices of the principal crops which he grows.

Improved means of communications have had another important effect in altering the nature of the famines to which so large a part of India is exposed, and in lessening their disastrous results. The development of irrigation and the improvement of agriculture enable the country in a normal year to grow a much larger quantity of foodstuffs than before, and it is now possible, thanks to the railways, to divert supplies from the export trade to the famine-stricken tracts. Famine now connotes not so much a scarcity or entire absence of food, as high prices and a lack of employment in the affected areas. The terrible calamities which from time to time depopulated wide stretches of country need no longer be feared. The problem of relief has been scientifically studied, and a system worked out which can be put into operation as soon as the recognised signals of approaching distress are apparent. Failure of the rains must always mean privation and hardship, but no longer necessarily wholesale starvation and loss of life.

It is clear that, if the basis of employment also be widened, crop failures will lose much of the severity of their effects, and the extension of industries, in as great a variety as circumstances will permit, will do more than anyth ng to secure the economic stability of the labouring classes.

Scarcity of capital for agriculture.

6. The capital in the hands of country traders has proved insufficient to finance the ordinary movements of the crops, and the seasonal calls for accommodation from the main financial centres are constantly increasing. This lack of available capital is one cause of the high rates that the ryot has to pay for the ready money which he needs to buy seed and to meet the expenses of cultivation. On the other hand, money is largely invested in the purchase of landed property, the price of which has risen to very high figures in many parts of the country. Proprietors freely spend their savings from current income on the improvement of land in their own cultivation, but loans from private persons for this purpose are obtainable as a rule only on terms quite disproportionate to the value of the improvements. These are also almost invariably made on land in the investor's own possession, not in that of his tenants. The magnificent irrigation systems of India, the drainage works of Bengal, and the relatively small amount that has been advanced by Government as improvement loans are almost the only instances where public funds have been definitely devoted to

this end. The demand for capital for land improvement has hitherto perhaps been modest ; but the stimulus afforded by the various provincial Agricultural and Industrial Departments, especially in Madras, has led to the introduction on a small, but rapidly increasing, scale of modern appliances to replace labour, improve cultivation, or supply irrigation water. Towards the provision of working capital for cultivation, something has been done by the co-operative movement, initiated and fostered throughout by Government action, and far more may be hoped from it in the future. But the no less urgent necessity of relieving the ryot from the enormous load of debt, with which he has been burdened by the dearness of agricultural capital, the necessity of meeting periodic demands for rent, and his social habits, has hitherto been met only to a very small extent by co-operative organisation.

Labour and wages in rural India.

7. It is impossible to pass from this brief sketch of the agricultural position without some allusion to the rise in the rate of wages and the growing scarcity of labour in most parts of the country. The rise in the cost of labour is due mainly to the increased demand, but in some places to the decline in the labouring population consequent on the ravages of plague during the past twenty years and on famine in the last decade of the nineteenth century, although we do not forget that the population as a whole increased by some twenty millions between 1901 and 1911. This period of distress was followed by a sequence of more favourable seasons combined with higher world-prices. This prosperity in its turn led to greater expenditure by Government, railway companies, and private enterprise, necessitating increased employment. Simultaneously, the increase in world-prices, which became effective in India owing to the rapid extension of communications, brought the cultivator more money, and the consequent rise in the cost of living furnished an additional argument to the labourer in his claim for higher wages. This rise tells heavily on those sections of the population which are not benefited by the increased agricultural and industrial production, and has accentuated the tendency of the village artisan to migrate to the towns, where better pay is obtainable.

Middlemen and the export trade.

8. The export trade from country districts generally suffers from the existence of an undue number of middlemen, who intercept a large share of the profits. The reasons for this are various. In the first place, it must be remembered that a great number of Indian cultivators are indebted to a class of traders who not only lend money, but lend, purchase, and sell grain, and sell such articles as cloth, salt, and oil to small consumers. The position of a peasant farmer, with grain, seeds or cotton to sell, and at the same time heavily indebted to his only possible purchaser, effectually prevents him from obtaining a fair market price for his crop. Even where the farmer is not burdened by debt, his business with the dealer is still very often on a *per contra* basis, his purchases and sales being alike reckoned in cash in the dealer's books, at a rate which is not always known to the customer at the time.

The farmer, owing partly to poverty and partly to the extreme sub-division of land, is very often a producer on so small a scale that it is practically impossible for him to take his crop to the larger markets, where he can sell at current market rates to the agents of the bigger firms. This is especially the case in Bengal, Bihar and Orissa, and the United Provinces. Here most of the articles of export are purchased from local dealers by the exporting agencies. The larger markets are usually frequented by an unnecessary number of brokers and touts; and there are almost always one or more intermediaries between the purchaser who moves the grain to the point of consumption or export, and the producer or other person who actually brings the crop into the market. The market rules and organisation do not usually provide means for preventing or punishing fraudulent trade methods; while the multiplicity of the local weights and measures, and, in many cases, it must be added, the natural desire of the seller not to be the only person defrauded, contribute still further to an undesirable state of affairs. Complaints are frequent, but all parties accept what appears to them the inevitable. But, where a better organisation has been established, the ryots thoroughly appreciate the benefit. A better market system, co-operative selling, and education are the most promising remedies.

Effect of Imports.

Influence of imports on village life.

9. Such are some of the far-reaching effects on country life of the increased flow of exports from India. The greater number and variety of imports have also had their influence, though in a less marked degree. Vessels and implements of iron, brass, and copper are now commonly used in the villages, and their price is within the reach of almost all classes. Petty articles of domestic use or personal ornament, such as scissors, mirrors, bangles, and the thousand and one cheap and glittering trifles with which the rural huckster decks his stall, have poured in from abroad. Drugs and patent medicines of all kinds, Indian and foreign, command a ready sale. Sewing machines are found nearly everywhere, and bicycles are in ever-increasing demand.

The effect on small industries in India has been considerable, but has not always been in the same direction. The import of brass sheets, for example, has reduced the demand for the services of the brass founder, but has greatly extended the business of the maker of brass hollow-ware. Cheaper iron obtainable in convenient sections has helped the cultivator to buy more and better carts, and has diminished the cost of many of his indigenous implements. The position of the village artisans is changing. The tendency is for them to lose their status as village servants, paid by the dues of the village community, and to become more and more ordinary artisans, who compete freely among themselves for custom; in some cases, notably that of the village leather worker, they are disappearing under the competition of organised industries. The influx of mill-made piece-goods, not only of foreign, but of Indian manufacture, had before the war cheapened the price

of cloth in comparison with other commodities and had enormously extended its use by the poorer classes, but had, at the same time, prejudicially affected the communities of weavers scattered over the country in the towns and larger villages. In India a far greater degree of resistance has been offered by the hand loom to the aggressions of the factory than in England. This is attributable to the great number of specialised types of cloth of which slow-moving Indian custom decrees the use; to the fact that the demand for many of these is on so small a scale, while the types themselves are so special, as to render it difficult for the power loom to produce them at a profit; to the faithfulness of the weavers as a caste of their hereditary trade, and their unwillingness, especially in the smaller towns, to take up factory work; and, to a less extent, to the money locked up, on a vicious system it is true, in the financing of the weaver by his patron and incubus, the money-lending cloth merchant.

Standard of comfort affected by imports.

10. The effect of the use of imported and factory-made articles on the standard of comfort of the rural population has been, however, generally small. The poverty of the Indian peasant precludes most novel forms of expenditure, while lack of education and the prescriptions of custom make him slow to accept any innovations in his food or clothing, or in the habits of his daily life. But the enormously extended use of cotton cloth, especially of the finer counts, of woollen clothing, the introduction of kerosene oil, matches, collapsible umbrellas, and of better and cheaper cutlery and soap, have added appreciably to the comfort of the people.

The increase of exports and imports has facilitated the provision of funds for communications. The existence of these communications has itself had an educative effect on the people, has gradually helped to render labour more fluid and incidentally more costly, and has added to the sense of political unity among the more educated classes.

This rough sketch may serve to illustrate the effect of modern industrial and commercial development on the rural areas which furnish most of the raw material of Indian trade and industry and, so far, almost all the markets for the latter; and we may now turn to a study of some of the principal centres of industry where its progress is most readily discernible.

CHAPTER II.

Some Industrial Centres and Districts.

Diversity of conditions in different parts of India.

11. The great dissimilarities of soil and climate and the diverse causes which have affected the development of the various parts of India are responsible for wide and striking inequalities of economic conditions. The stony, arid Deccan uplands, where the precarious rainfall will scarcely allow the thrifty Maratha farmer to hope for a good harvest even in one year out of two, afford a marked contrast to the rich alluvial plains of Bengal, a land that has little to fear from the seasons but occasional floods. The canal zones of the Punjab, with their secure crops of wheat and oil seeds, are intermixed with the desert plains of the *barh*, that yield hardly more than a scanty pasturage for camels or cattle. Only a very few miles away from large and prosperous ports or busy mining districts are wide stretches of jungle or sandy deserts. A mere general outline of the economic position in India would be of no value for the purposes of this report, while to delineate the whole picture in detail would be impracticable. The most convenient way of presenting the commercial and industrial conditions of the country, as a basis for our proposals, is by a description of selected areas or centres as specimens of economic development, in which the factors with which we have to deal appear in varying circumstances and degrees. Prominent among these are the great cities of Bombay and Calcutta; up-country manufacturing towns like Cawnpore; distributing markets like Delhi; the cotton and jute tracts, where machinery and markets have been gradually called into existence to deal with important commercial crops; the railway workshops; and the coal and iron districts of Bengal and Bihar. These are alike characterised, in a greater or less degree, by the presence of large traders and leaders of organised industry, accustomed to buy and sell or to manufacture on a wholesale scale and in close touch with the conditions of world markets and world industries; of aggregations of capital; of groups of factories and bodies of semi-skilled or unskilled labourers, who have migrated thither, temporarily or permanently, from distant places, leaving the homes and small farms which they often still possess to the care of their families or relatives; and of larger or smaller engineering works, which have sprung up to supply the needs of organised industries and require the services of skilled mechanical engineers and artisans.

The large agency firms.

12. A characteristic feature of organised industry and commerce in all the chief Indian centres is the presence of the large agency firms, which, except in the

case of Bombay, are mainly European. In addition to participating in the export and import trade, they finance and manage industrial ventures all over the country and often have several branches in the large towns. The importance of these agency houses may be gauged from the fact that they control the majority of the cotton, jute and other mills, as well as of the tea gardens and the coal mines. This system originated and has still continued owing to the ability of these houses to furnish financial help to industries; it also owes its existence to some extent to the difficulty, in the case of companies under European control, of finding among the relatively small class of leading men of business available in India directors, especially managing directors, who will remain in the country long enough to guarantee the continuous supervision requisite for the successful conduct of such businesses. An agency firm as a rule comprises several partners, some of whom are taking their turn of duty in India, while the others attend to the firm's affairs in London or elsewhere. There is no doubt but that the system is in many ways well adapted to present conditions in India, and has a far greater list of successes to its credit than can be shown by ordinary company management under individual managing directors. We are much impressed by the strong evidence of the high financial prestige possessed by the better-class agency firms, and of the readiness of the investing public to follow their lead, a position only reached, we recognise, by a policy, extending over many years, of efficient management, cautious finance and watchful attention to the interests of client enterprises. Nevertheless, they have not escaped criticism as being unduly conservative in their methods of business and as exhibiting undue reluctance to embark on new ventures. They have been charged with lack of enterprise and an unwillingness to follow up lines of development naturally proceeding from the expansion of operations in their own specialised industries. In other words, they have been inclined to develope commerce rather than industries, and have thus been at times less helpful than might have been the case, in clearing the way for continuous industrial progress.

In recent years, however, a new spirit has arisen, evoked by the genius of a few men who have boldly faced the industrial needs of India and have not been deterred by the large scale on which it is necessary to start operations. They have instituted such thorough preliminary enquiries that they have been able to accept the conclusions reached with confidence and, when these were favourable, to act upon them. The success which they have achieved as a result of the scientific methods adopted has encouraged others to similar efforts, and these have been further stimulated by the war, which has clearly demonstrated the vital necessity for industrial development and has, temporarily at least, lessened foreign competition.

Calcutta.

13. The large centres are not numerous, and are of such importance to the surrounding districts and so decidedly differentiated from them as to warrant a more detailed and individual description.

Calcutta, in spite of the position and consequent expense of the port 120 miles from the open sea and on a dangerous river, has immense, natural advantages in its situation on the estuary of the mighty river system which traverses the fertile and populous plains of Bengal, and in the fact that it is the undisputed centre of the great jute, tea and coal industries.

The jute industry.

14. Jute was apparently first shipped from Bengal in 1795 by officers of the East India Company seeking an Indian substitute for hemp, but it was not until 40 years later that pure jute yarn was made and sold in Dundee. Subsequent exports of the raw material grew rapidly, especially during the Crimean and the American Civil wars, when supplies of Russian flax and hemp and of American cotton respectively were cut off from the European markets, until in 1908-09 they totalled 893,955 tons; thereafter they have shown some tendency to decrease. In Bengal the hand-loom industry assumed considerable proportions in the first half of the 19th century, and, as late as 1850, the value of the manufactures exported exceeded that of the raw jute; but it was not until 1855 that the first machine-spinning mill was erected at Rishra near Serampore, followed after four years by the first power-loom factory at Barnagore just outside Calcutta. In 1881, 5,000 power looms were at work in Bengal; in 1891, 8,000; in 1901, 16,000; and in 1911, 33,000 in 59 mills, while the latest figures available (1916-17) show 71 mills running with 39,404 looms and employing 260,199 persons. The paid-up capital of these concerns, including debentures but excluding reserves, amounts to 13¼ crores of rupees and 2¼ million pounds sterling; and the mills now manufacture over 1,000,000 tons of the raw material annually. Jute manufactures exported in 1913-14* reached a total value of 28¼ crores of rupees for all India, while in the same year exports of raw and manufactured jute together were valued at 59 crores, or almost 25 per cent. of the total exports of Indian merchandise. Including India's internal consumption of jute manufactures, the annual average value of the jute trade to Bengal has been computed at 60 crores of rupees, or £40,000,000 sterling at the pre-war rate of exchange. The association of the Calcutta jute industry with the east coast of Scotland has throughout remained intimate. The majority of the European staffs are of Dundee extraction, and most of the experts in the managing firms are Scottish. A few jute mills are driven by electric power generated from coal, and the plant is usually of an up-to-date type and maintained at a level of efficiency which is relatively high for India. The average jute mill is generally, it must be remembered, on a larger scale than the average cotton mill.

Labour in the jute mills.

15. The mills draw their labour mainly from Bihar and Orissa, the United Provinces, the northern districts of Madras and Bengal. The Bengali is taking a

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* We have taken the latest figures available, except in cases where obviously the figures are seriously affected by war conditions; *e.g.*, exports and imports, and in some cases railway transport.

smaller and smaller share in the openings for manual labour created by the mills. Some interesting proofs of this tendency are cited in a note placed before us in Calcutta, from which we take the following particulars. In a Government report on labour in Bengal (1906), it is stated that 20 years earlier all the hands in jute mills were Bengalis, but that at the date of the report two-thirds of them were immigrants. At the present time about 90 per cent. of the labour is imported. A census was taken in 1902 by the managing agents of four mills in Garulia, Bhadreswar and Titaghur. Another census was taken by the same managing agents in the same areas in 1916, the mills having meantime increased to seven. The result showed 28 per cent. of Bengali workers in 1902, and 10 per cent. only in 1916. The shortage had been supplied from the Northern Circars. It is significant that there were 350,000 more immigrants in 1911 than in 1901 in Calcutta, the 24-Parganas, Howrah and Hooghly. In the 24-Parganas in particular, the number of immigrants had increased by 176,000, or nearly 80 per cent.

The mill workers are in almost all cases recruited by and employed under a class of men known as *sardars*, usually themselves of similar origin to the labour they supply. Some mill-owners complained to us of this system, which is an obstacle to progressive management, and does not conduce to industrial peace; but they professed their inability to alter matters. The labourers live as a rule in what are known as *bustis*, collections of huts in the neighbourhood of the mills, which are neither owned nor leased as a rule by the mill management, but are often the property of the *sardars*. This last is an eminently undesirable practice. In these *bustis* the workers are poorly housed among surroundings usually insanitary and unpleasant, though praiseworthy efforts to improve matters have been and are being made on an increasingly large scale by mill-owners, who have erected dwellings on or near the mill premises for a proportion of their labourers. The latter are ready enough to avail themselves of the accommodation provided. The position of mill labour in general and the housing question in particular, form the subject of Chapter XVI. Specimen wages of jute-mill operatives in June 1918 are exhibited in the statement below. The figures are in rupees per mensem :—

Carders.	Rovers.	Spinners.	Shifters.	Winders.
9	12	14¾	11	18

Beamers.	Weavers.	Mistries.	Coolies.
22	27	30	13

Wages are paid weekly, one week in arrears.

Mill-owners complain of the unwillingness of their labourers to respond to the stimulus of higher wages ; the latter do not as a rule increase their output when engaged on piece-work, but merely work fewer days in the week. The reasons for this were investigated in some detail by us. We have little doubt but that the long hours passed in the uncongenial. if not unhealthy, surroundings of a factory, from which the labourer returns at night to a dirty, crowded and insanitary hovel, where his only

relaxations are found in the liquor shop and the bazaar, are most unattractive to a man accustomed to rural life, and it is only the congestion existing in his native district, and the desire to earn higher wages for a time, that lead him to submit to such conditions. The mill workers of Bombay and Calcutta do not for the most part remain permanently at the mills, but return after a longer or shorter period to their native villages, though they eventually drift back in many cases to the mills. This practice affords a much needed change from the conditions under which the labour force lives and works, conditions which can never create a skilled and steady class of operatives. The labourers are, moreover, almost entirely uneducated; the facilities for the education of their children in the villages from which they come are, it is believed, quite inadequate; whilst in the neighbourhood of the mills, for children who are taking their share in mill labour, they exist only in the few cases where they have been provided by enlightened employers. More will be said in a later chapter regarding the problem of the education of juvenile factory workers; it is sufficient here to point out that, without education, a standard of comfort that will respond to the stimulus of decent housing and lead to a desire for increased earnings is not likely to be attained.

Share taken by Indians in the Jute industry.

16. It is a noteworthy fact that Bengali, or indeed Indian, capitalists have taken very little part, otherwise than as mere investors, in the starting, and none at all in the management of jute mills. The step from trading in and financing cotton to its actual manufacture was readily taken, with the help of English textile experts, in Bombay, where the weaving of the local staple by hand was a prominent industry before the import of mill-made goods. Similarly in Bengal the weaving of jute fabrics was an important industry in the first half of the last century and, until very recently, the initial collection and finance of jute were mainly in Bengali hands; but in Calcutta the Bengali merchant, who had settled there to take his share in general trade, was apparently unable to pass on from that stage to manufacture and, even in his commercial business up country, he is yielding ground to the more enterprising Marwari trader from Rajputana.

There is another reason which may perhaps have contributed to this failure on the part of the Bengali to take advantage of his position. British capital and expert skill have been freely poured into the Calcutta jute industry owing to the advantages of its location, while, for almost 40 years past, the industry in the United Kingdom has stood still, in point at least of the quantity of jute consumed.

Engineering firms and miscellaneous factories.

17. The existence of jute mills, of tea and jute cultivation in Assam and Bengal, of busy river traffic and a great port, and the neighbourhood, in more recent years, of coal mines, have led to the establishment of engineering firms, some of considerable size, in or near Calcutta, the number of which in 1915 was stated to be 27, with 12,000 employés.

There are also in and around Calcutta various miscellaneous factories, the most important being the flour and paper mills, the labour supply of which is recruited and organised on the same basis as that of the jute mills. A noteworthy feature of Calcutta industrial life, which has become much more prominent in recent years, is the number of small organised industries recently taken up by Indians, such as tanning, pottery and pencil making; also the many small power factories for oil milling and rice husking owned by them. The rapid increase in the number of these latter leads to the belief that they earn a profit, though the condition of their plant usually leaves a good deal to be desired in point of efficiency.

Sea-borne and inland trade.

18. The sea trade of Calcutta in normal times is carried by certain regular lines, and by a number of tramp steamers and a few sailing ships. The number of vessels entered and cleared from the port of Calcutta in the year 1913-14 was 999, of 3,077,199 tons burden. The figures for imports and exports of private merchandise in the same year were (in thousands of rupees):—

Chief heads.	Value.
Imports.	
Cotton manufactures	28,87,14
Twist and yarn	95,44
Metals and ores	9,66,17
Sugar	6,46,73
Machinery and mill work	3,20,64
Oils	2,05,66
Hardware	1,42,31
Total under all heads	74,49,52
Exports.	
Jute manufactures	28,20,24
Jute, raw	28,03,44
Tea	10,55,75
Hides and skins	8,47,59
Grain, pulse and flour	6,85,60
Seeds	3,59,07
Total under all heads	98,50,27

A vast amount of traffic passes down the Hooghly by river steamer and country boat: the two principal river steamship companies own 204 steamers and 313 flats. The total merchandise thus brought into Calcutta in 1913-14 was 1,126,000 tons, the leading lines of goods being raw jute 334,000 tons, gunnies 188,000 tons, and rice and paddy 198,000 tons. The Eastern Bengal and the Assam-Bengal Railways share with the river craft the trade of the fertile and densely populated jute and rice districts of northern and eastern Bengal. The Bengal-Nagpur Railway traffic consists mostly of coal and of seeds and food-grains from Orissa and the Central Provinces. The East Indian Railway, which is the largest system of the three that terminate in Calcutta, imports

food-grains and seeds from northern India and south Bihar, and handles the bulk of the coal traffic. The total volume of the rail-borne trade of Calcutta in 1913-14 reached 10,389,000 tons, of which imports amounted to 8,605,000 and exports to 1,784,000 tons.

A large share of this trade is in the hands of a class of Indian, mainly Marwari, merchants, who as a rule have not hitherto directly handled oversea imports (except piece-goods, cheap iron and galvanised sheeting) or exports, but have carried on their trade in import and export goods through European houses. These latter export country produce and manufactures, the greater proportion of which is, however, in the case of the largest firms, purchased by their own agents up country, and import piece-goods, metals, machinery, sugar, etc. The export trade here, as in other large Indian ports, is financed by the exchange banks, who purchase the bills which exporters draw on consignees or their bankers or agents in other countries, and to a certain extent by large importers direct.

Bombay.

19. The city of Bombay owes its origin to its geographical position and to its magnificent harbour, which gradually became a collecting centre for other ports on the west coast and for the relatively small strip of land between the Ghats and the sea. During the closing years of the Maratha power, the contrast afforded by the peace and security of Bombay with the disturbed Deccan was responsible for a great addition to the wealth and population of the city. The introduction of a more settled rule in the country above the Ghats was almost immediately followed by the making of a road over the Bhor Ghat to Poona. From that time progress in communications between Bombay and the country to the north and east has been continuous; and it is now connected with Gujerat and northern India by the Bombay, Baroda and Central India Railway, and with the Deccan, Central India, the Gangetic plain, Calcutta and Madras by the Great Indian Peninsula Railway. Bombay thus receives a large quantity of country products of all kinds, of which by far the most important is cotton; it lacks the advantages which Calcutta possesses in its proximity to the coal fields and in the river system of Bengal, though its harbour opens directly on the sea and affords greater possibilities of improvement, of which full advantage is being taken. The traffic in and out of Bombay over the railways in 1913-14 was (in thousands of tons):—

Trade and communications.

Inward	3,230
Outward	1,642

Amongst the principal items were (in thousands of tons):—

Imports.		Exports.	
Raw cotton	520	Cotton manufactures	98
Oil seeds	904	Metals and machinery . . .	229
Wheat and flour	324	Sugar	155

20. The principal industry of Bombay is the spinning and weaving of cotton, of which, however, it possesses by no means the monopoly which Calcutta can claim in the case of jute manufacture. An account of the origin of the Bombay cotton industry will be found in Chapter VII. In the year 1916 there were 266 mills in India, containing 6,839,877 spindles and 110,268 looms and employing an average number of 274,361 hands daily; of these Bombay itself possessed 86 mills, 2,984,575 spindles and 53,205 looms, and the persons employed numbered 118,303. Cotton spinning and weaving, though India's share in the industry is mainly confined to the lower counts, require finer manipulation than the process of jute manufacture, and demand more skill on the part of the operatives. Though the first Indian cotton mill was opened in Calcutta and other attempts have been made since to establish a cotton industry there, these, with few exceptions, have been far from successful. Calcutta is no doubt less favourably situated in respect of the cotton tracts generally than Bombay, although much of the cotton consumed by the latter reaches it from places as distant as those from which Calcutta draws its supplies, while Bombay is at a disadvantage in respect of fuel, a deficiency now to some extent supplemented by water power.

The cotton industry.

21. The Bombay mill operative, whether owing to his training or not, is more skilful and intelligent than the Bihari immigrant into Calcutta, though probably no better educated, while he is more tolerant of uncomfortable surroundings than the Bengali labourers, who possess a relatively high degree of intelligence. The wages of mill labour are higher in Bombay than in Calcutta and have been raised appreciably since 1914. Sample rates, including a war bonus, for Bombay in the year 1918 were (in rupees and annas per mensem) :—

Labour in the cotton mills.

	Rs	As.
Drawer (cardroom)	23	6
Reeler	17	4
Warper	40	8
Rover	24	1
Doffer (cardroom)	12	10
Weaver	46	15

Although wages are higher in Bombay, local conditions, so far as they affect the housing of labour, are more difficult in the island of Bombay than round Calcutta. The Calcutta mills are spread out over a long stretch of land on both banks of the river, and the labourers live, as we have seen, in *bustis*, or collections of single-storeyed huts. Owing to the lack of space in Bombay, the mill hands live in chawls, buildings several storeys high divided into a number of single-room units, which are too often overcrowded. This congestion has intensified the effects

of plague, an ever-recurring factor in the problem of the industria labour supply.

The labourers consist mostly of Marathas from the Deccan and Konkan, a small section of Konkani Mahomedans and Julhais (the Mahomedan weaver caste), with a few men from Central India. The first two classes are usually cultivators of holdings too small to afford them a subsistence, and heavily indebted to the village money-lender. This habit of indebtedness adheres to them in Bombay, where they, in common with other mill hands, are usually deeply in the books of petty money-lenders. The few mill hands from Central India and the Julhais are far more careful with their money and work harder. The former indeed are rarely in debt and occasionally even lend to their weaker brethern. There is more specialisation in different departments of the mill by workers of particular castes or origin than in Calcutta. The mill hands are recruited by and employed through a class of men known as jobbers, and are paid monthly, one month in arrears.

These remarks do not apply to the handling of goods for export and import, and the work at the docks, which require labourers of a different type.

Other industries.

22. Among the main industries of Bombay, other than the cotton mills, are the engineering shops, which have sprung up here for the same reasons as at Calcutta, though they are less extensive and numerous. The more important concerns numbered 12 in the year 1915, the largest of which employed over 800 hands. There were in addition two silk mills, four flour mills, and a considerable group of tanneries producing half-tanned leather, with one large tannery and leather factory employing about 500 hands.

The disadvantage under which Bombay for so long laboured, owing to its distance from the coal fields, has recently been largely reduced by the facilities which the proximity of the Western Ghats affords for the generation of hydro-electric power. This has been utilised by the enterprise of a great Bombay firm, whose hydro-electric works at Lonavla produce 42,000 horse power and deliver it at a charge of ·5 annas per unit, where motors are supplied by the mills, and ·55 annas, where they are found by the hydro-electric company. Other schemes on an even larger scale are under construction and in contemplation.

Sea trade.

23. The sea trade of Bombay, in addition to ordinary country produce, consists mainly of the export of raw cotton and of locally manufactured yarn and piece-goods, and the import of foreign piece-goods and yarn, sugar, metals, machinery and miscellaneous articles. The figures of imports

into and exports from Bombay by sea in 1913-14 under the leading heads for trade were as under (in thousands of rupees) :—

Chief heads.	Value.
Imports.	
Cotton manufactures	16,51,50
Cotton twist and yarn	1,49,53
Silk manufactures and yarn	2,26,05
Wool manufactures and yarn	1,62,89
Metals and ores	7,16,69
Machinery and mill work	3,08,88
Hardware	1,32,02
Sugar	3,83,78
Oils	1,34,35
Total under all heads	94,18,99
Exports.	
Cotton, raw	29,70,81
Seeds	12,54,98
Cotton twist and yarn	9,21,00
Cotton manufactures	1,17,90
Metals and ores	1,10,21
Total under all heads	74,46,39

The railway connection with the docks was until recently very inconvenient, necessitating a double handling of goods; and the transport of cotton by carts to the Cotton Green at Colaba and back again to the mills or docks adds to the cost and congests the streets. Matters will be much improved when the new scheme for direct connection between the railways and docks, involving the construction of extensive storage accommodation and the transfer of the Cotton Green to the neighbourhood of the docks, has been completed.

The principal shipping lines are much the same as those of Calcutta; in addition, there are the pilgrim traffic to the Hedjaz and trade to the Persian Gulf, in which Indian firms share largely. The coasting trade with Karachi, Kathiawar, the Malabar coast and Goa is of some importance. Indian-built sailing craft participate in this and also visit the Persian Gulf and the coasts of Arabia and East Africa. In the year 1913-14 the number of ships entered and cleared from the port of Bombay was 1,536, with a tonnage of 3,837,111.

Share taken by Indians in Bombay trade.

24. The trade of Bombay is shared by Europeans, Parsees, Bhatsias Khojas and Banias. It is financed by banking agencies similar to those in Calcutta, branches of the same banks being, with few exceptions, found in both cities. The mills obtain a certain proportion of their finance in the form of deposits from the public. Bombay as a financial centre has been and is still prone to speculation and the movements of the cotton market and of stocks and shares are always active and sometimes violent. There are, as in Calcutta, a number of firms and indivi-

duals doing exceedingly remunerative business as brokers in articles of merchandise, insurance, freight and exchange, as well as in stocks and shares.

The most noteworthy difference between the two cities is the large share taken by Indian merchants in the trade and industry of Bombay, a subject which is treated in greater detail in Chapter VII. Indians predominate in the share market, as mill-owners, and as importers of and dealers in country produce and cotton brought into Bombay from the rest of India. The foreign export and import trade is, however, still mainly in European hands, though a certain number of ships are owned by Indian firms, and Indians are also active in the freight market. The Indian element in banking is much stronger in Bombay than elsewhere ; there are several banks with Indian directors ; and they are also found on the Board of the Presidency Bank.

The Bengal Coal Field.

25. The coal fields of Bengal and Bihar include all the principal coal mines of India, the remainder being situated in Assam, the Central Provinces, the Hyderabad and Rewah States, the Punjab, Baluchistan and the State of Bikaner. The raisings in the Raniganj, Jharia and Giridih coal areas, which may conveniently be described as the Bengal coal field, were in the calendar year 1917, 16,563,990 tons, out of a total output for the whole of India of 18,121,918 tons. The movements from the Bengal coal field were in 1914, when trade and industry were still flowing in their ordinary channels, to Calcutta 5,353,844 tons, to Bombay 535,806 tons, and to the United Provinces 1,253,068 tons. The importance of this area to the industries of India is clear from the above figures.

The proportion of the total output of coal consumed by railways has remained almost unchanged for a number of years past and, since 1907, has not been higher than 33 or lower than 28 per cent. A more accurate census of coal consumption than in previous years was attempted in 1916. Though these figures were largely affected by the war, it is of interest to notice that 33·6 per cent. of the output was taken for railways, 16·7 for bunkers, 5·6 for jute and 5·5 for cotton mills, 5·1 for iron and brass foundries and engineering workshops, and 3·6 for inland steamers. Other heads are comparatively small, but no less than 12·6 per cent. was consumed at the collieries or wasted, and a similar quantity was taken up for use in small industries or for domestic consumption, almost entirely the former.

The Bengal coal field in 1917 was worked by 153 joint-stock companies, of which the paid-up capitalisation in shares and debentures was Rs. 672 lakhs. There were in addition many mines owned privately by syndicates and individuals.

Methods of working.

26. Coal was first mined in Raniganj for other than local requirements in 1854 when the East Indian Railway entered the Bengal coal field. The industry is at the present time by no means entirely in the hands of Europeans,

though they are responsible for the working of most of the largest and best developed mines. The majority of Indian enterprises consist of small pits or inclines; where they possess pumps or winding gear, these are usually worked by small engines with vertical boilers. Such concerns are readily closed down if prices fall too low, and are as readily started again when the market improves. The technical development, however, which has been attained by the better-class mines, is a striking feature of the Bengal coal field and one of its main points of interest to students of the organised industries of India. A number of mines are now electrically operated, and two groups at least are provided with central electric generating stations, while considerable further developments in this direction are contemplated. Sandpacking to prevent subsidence is now practised in some collieries. Mechanical screening is largely in use; aerial ropeways are working in several places; and the difficulties caused by the locking up of coal under the numerous railway sidings that traverse the various fields will, it is hoped, be solved satisfactorily before long. Coke is produced in all parts of the area, especially the so-called soft coke, about 500,000 tons of which are made per annum, as a rule by the smaller proprietors, by burning low-grade coal in heaps in the open air. Coke is also largely made by the wasteful process of burning in open-top rectangular kilns. The first by-product coke ovens were started at Giridih. There are now several other such installations on the field, producing coal tar and sulphate of ammonia, the latter with the help of imported sulphur. There are in addition a quantity of non-by-product patent ovens. It may be noted in passing that a coke, which will readily ignite and can be used in the Indian domestic fireplace, is urgently needed, and might, if a suitable cheap type of fireplace be also introduced, lead to a sensible decrease in the amount of cattle dung used as fuel, at any rate in the districts surrounding the coal fields.

The coal royalty owners are the local zemindars who under the Permanent Settlement are the owners of mineral rights. They are at present a class of mere rent chargers who take little interest in the working of their property, although great waste occurs, especially in the mines managed by the smaller interests.

The so-called first-class coal of the Bengal field rarely contains less than about 12 per cent. of ash, but it generally forms a strong coke suitable for blast furnace work, and any serious development of the metallurgical industries in this region will probably result, and that before long, in a relatively heavy attack on the visible resources. The question of encouraging and even compelling economy in mining and coking will soon be forced on the attention of the authorities.

Labour on the coal field.

27. The labour on the mines is partly drawn from neighbouring villages, partly from the more distant areas of Chota Nagpur. The average daily number of labourers employed in the Bengal coal field in 1916 was 135,093; the average daily wage per head was 7·6 annas; and the annual raisings per head of labour employed below ground were 169·4 tons.* The

* For all India.

supply of labour is at present insufficient and intermittent; and is liable to be seriously affected by a good harvest or by an outbreak of epidemic disease, to some forms of which the coal fields have in the past been liable. Only a small proportion of the workers, except in the case of one or two old-established concerns, reside permanently at the mines. The rest are usually small cultivators or agricultural labourers, who return to their villages for the cultivation and harvesting of their crops. But a new generation of workers is growing up, which can be induced to settle down as resident labour near the mines, especially if suitable accommodation be provided. Though constant efforts are being made to arrive at the ideal workman's dwelling, finality is far from having been reached, and changes of type are still frequent. The worker himself undoubtedly prefers separate huts, if possible with a small plot of garden ground. The objection to this is, of course, the expense involved, and the only area in which we saw separate huts provided on a large scale for organised labour was the Mysore gold field.

The Bengal Iron and Steel Company.

28. The Bengal Iron and Steel Company at Kulti and the Tata Iron and Steel Company at Sakchi are most important industrial enterprises in close connection with the Bengal coal field.

The works of the Bengal Iron and Steel Company, unlike the Tata Company's works, have grown up gradually. They were originally started in 1875, but had a somewhat chequered history, and did not come into the hands of the present Company till about 1889. The poor quality of iron ore previously used was largely responsible for the failure of the Company to make steel at a profit in 1905 and onwards, but the managing agents, after nearly 20 years' unremitting labour, have now put the concern on a paying basis, a result to which the discovery of a body of better-grade ore greatly contributed.

The works have been extended and remodelled. They contain four blast furnaces, each with a possible output of 80 tons of pig a day. About half the coke required is made by the Company and the balance is purchased locally.

The steam is generated in boilers fired by the waste gases from the furnaces. The output of pig iron, under normal conditions, is about 10,000 tons a month. Since November 1917, one furnace has been turning out from 1,200 to 1,500 tons a month of ferro-manganese, which is exported to Europe and America for war purposes. The works contain a large foundry making pipes up to 12 inches in diameter, bends, columns, fencing sockets, pot sleepers and chairs, and are capable of producing castings up to 20 tons in weight. The Company employs about 10,000 men.

The Tata Iron and Steel Company.

29. The Tata Iron and Steel Company was formed in 1907 and commenced active operations about five years later. It owns iron mines at Gurumasini and elsewhere in India; limestone quarries at Panposh in the Gangpur State and at Khansbahal; magnesite deposits in

the Mysore State; and nine large coal mines, four of which are located on the Jharia field and are now producing 55,000 tons a month. The smelting plant consists of two large blast furnaces making approximately 350 tons of iron per day each, and three more furnaces are in process of construction. Coke is at present supplied to these furnaces by 180 non-recovery Coppee coke ovens, with a capacity of 7½ tons each. The new plant under construction consists of 200 13-ton by-product recovery ovens, and a benzol recovery plant for the coke oven gases. The steel-making plant consists of four basic open-hearth furnaces of 50 tons capacity, two furnaces of 75 tons capacity and a seventh furnace in process of construction, while further extensions are now under way consisting of two 25-ton Bessemer converters, three electric furnaces, two 200-ton tilting furnaces and a mixer of 1,300 tons capacity to receive the molten metal from the blast furnaces.

The present steel capacity is nearly 17,000 tons per month. The rolling mills produce about 120,000 tons of rails and smaller sections yearly. The Government of India agreed, before the works were started, to take 20,000 tons of steel rails a year for ten years from the Company, provided they could be produced of suitable quality and at a suitable price; but, on account of the heavy demands in the eastern theatres of war, much larger quantities have been taken. The Company is now preparing to build a 96-inch plate mill. Arrangements for further extensions have also been made with a view to producing sheet steel, plates and strips for the manufacture of tubes. The total developments now under contemplation will involve an expenditure of no less than 12½ crores of rupees.

About 13,000 men are now employed by the Company and 10,000 men by contractors engaged in extensions. The mines and quarries give employment to approximately 15,000 more. A town of 50,000 inhabitants has sprung up at Sakchi, the population of which, it is expected, will be over 100,000 by the time the extensions are completed. Suitable residences for all classes of employés have been erected, including cooly lines for about 1,000 of the lowest-paid workmen. Two institutes, a primary school, an elementary technical school and a large hospital have also been provided by the Company, and a school for girls is now under consideration.

Engineering works.

30. In addition to the above, engineering works which cater for the public or for groups of mines are springing up, like those at Kumardhubi near Barakar, where also fire-bricks, silica and magnesite bricks are now being manufactured for the iron and steel furnaces. Another important industry in this district is the large pottery at Raniganj, where pipes, fire-bricks, etc., as well as certain kinds of pottery are produced.

The Deccan Cotton Tract.

31. The three most important crops requiring industrial treatment before transport, are cotton, jute and tea.

There are several parts of India where cotton is grown on a considerable scale, but the largest continuous area is that covering the northern Deccan, Berar, and the western districts of the Central Provinces and of Central India, where there are between six and seven million acres under cotton, nearly 700 gins and presses, and 35 spinning and weaving mills. The bulk of this cotton is exported to Bombay and Ahmedabad. When the railway began to serve these districts, at a time coinciding roughly with the cotton boom caused by the American War, most of the pioneer firms were European. Comparatively few, however, of the gins and presses are now in European hands, most of those so owned being the property of certain large export firms. The rest belong to Indian firms dealing in cotton, with their headquarters in Bombay or Ahmedabad or to Marwari and other Indian traders carrying on business locally; only a small part of the capital has been found, and an even smaller share in the management has been taken by local capitalists or business men. The labour in these gins and presses is seasonal and unskilled; but the demand for it has appreciably raised the price of other local labour, and the need for field hands in the cotton-picking season tends to maintain it at a high level. Fitters and engineers are fairly numerous; the former have usually been trained in railway workshops or mills, and are, here as elsewhere, ready to seek their living in any part of India, wherever may be their original home; the latter are either passed pupils of technical institutions, such as the Victoria Jubilee Technical Institute, Bombay, or have learned their work in local concerns. Mills are not numerous; they are owned in some cases by local, in others by Bombay capitalists, and are operated by more or less permanently resident labour. The crop is financed partly by branches of banks with their headquarters in Bombay, especially the Presidency Bank, and partly by Indian financiers and dealers, who belong mostly to Bombay or other parts of India. The inhabitants of these districts generally show a higher degree of enterprise than the people of the adjoining non-cotton areas to the east.

The above description will also apply fairly well to the cotton areas of the United Provinces, Gujerat, the Punjab and Madras; except that in Madras the gins and presses are to a somewhat larger extent in the hands of European firms, and in all these cases, except that of Gujerat, the arrangements for marketing and financing are less highly organised.

The Jute Districts.

32. The area under jute was 2,729,700 * acres in 1917. The quantity produced was 8,839,900 * bales of 400 lbs. each. The centres where the large buying agencies and the machinery for preparing the jute for export are situated are less numerous than in the case of the cotton tracts. Much jute is despatched to Calcutta unbaled, comparatively little diminution of weight being caused by the necessary cleaning and baling processes, while cotton is usually reduced about two-thirds in weight by the

* Final forecast for Bengal (including Cooch-Bihar), Bihar and Orissa, and Assam.

removal of the seed. The middleman is far more prominent here than in the cotton trade, owing to the smaller size of the individual holdings and to the necessity for sorting, bulking and grading the insignificant parcels of jute brought in piecemeal by the growers, before sufficient quantities can be collected to attract the larger buyers. The fact that much of the transport is by water also has some effect on the nature of the trade. The main buyers up country and in Calcutta are the employés of European dealers or manufacturers, or of rich Marwaris. The market in Calcutta, both for local consumption and for export, is nearly, if not quite, as active and speculative as the cotton market in Bombay. The cultivation of jute has brought a large amount of wealth into the eastern districts of Bengal; the local population is intelligent and unusually well educated for India. It is strongly averse, however, from undertaking manual labour for hire, and the crop is, as we have seen in the case of the Calcutta mills, handled by an increasingly large proportion of immigrant labourers from Bihar and the eastern districts of the United Provinces. These earn the highest wages paid for unskilled labour in any part of rural India except the Punjab, rates of Re. 1 and even more per diem being common in the busy season. The mechanical operations for the preparation of the crop are far less extensive and elaborate than in the case of cotton; artisans, engineers and labour of the factory type are, therefore, much less in evidence.

The Tea Districts of North-East India.

33. The position in the tea districts of Assam and northern Bengal is very different. The area covered by the crop is comparatively small, and it is grown in otherwise undeveloped tracts; and though it is relatively valuable in proportion to its bulk and to the acreage on which it is grown, its economic and agricultural importance is less than is the case with jute or cotton. It is generally accepted that the tea plant is indigenous in Assam, where it is known to have existed in a wild state long before its cultivation and manufacture were seriously attempted. The first steps in this direction, indeed, were taken not for the exploitation of the Indian plant, but with a view to experiment with seed from China in different districts in India. And although at an early stage attention was prominently attracted to the existence of the plant in Upper Assam, for a number of years China seed was brought over regularly and its cultivation was—unfortunately as experience proved—encouraged in preference to that of the Assam plant. The first sample of Assam-made tea was sent to England in 1838, but it was some years before tea culture in India became a commercial success. At the outset the investigation had been undertaken by Government, who may in fact be said to have pioneered the industry, but once it was proved that Indian tea could be put on the market to compete with the China product, the real beginnings of the Indian tea industry were established. This may be dated from 1852, and by 1868 the total quantity exported amounted to eight

Growth of the tea industry.

million pounds; after that time progress was rapid. Within recent years more scientific methods of cultivation have largely increased the average production per acre; for example, during the quinquennium 1885-1889, the average production per acre of the 310,595 acres under tea in all India was 291 lbs., while in 1916, the average production of the 650,823 acres under tea had increased to 566 lbs. Of the total production, north-east India, including parts of Assam and Bengal, is responsible for 90 per cent. and south India for 8 per cent. The total exports by sea in 1915-16 amounted to 338,470,262 lbs; the corresponding figures for 1916-17 showed a decrease, but this was due to freight difficulties, a large quantity remaining for shipment at the close of the year; the value of exports in 1915-16 was £13,320,715. The industry gives permanent employment to more than 630,000 persons, while there are also in all the tea districts considerable numbers of people who do part time work on the gardens.

Most of the more important gardens in north-east India are managed and financed by Calcutta agency firms, but recent years have seen an increase in the number of small Indian planters and companies. Every garden of any importance has its own factory where tea is prepared for the market, as it is essential that the various processes should be carried through immediately after the leaf has been plucked. The better organised factories are elaborately equipped with highly specialised plant and are under the supervision of expert tea makers.

Labour on the tea gardens.

34. The question of labour is one of much difficulty. Speaking generally, all the important districts have to obtain their labour from considerable distances. and this involves a heavy outlay and an elaborate machinery to control recruitment. Assam has always had to contend with special difficulties in view of its remoteness from the recruiting districts in the United Provinces, the Central Provinces, Bihar and Orissa and on the east coast; its importation of labour is regulated by the Assam Labour and Emigration Act, 1901 (VI of 1901), and, until recently, labourers were usually imported under a contract binding them for a period to their employers, to the breach of which penal conditions attached. Act XII of 1859 is, however, in force in Assam; under this Act penalties can be inflicted for breach of contract on labourers who have received advances and wilfully refuse to carry out a contract to work.

Indigo in Bihar.

35. A word may perhaps be said in passing on the indigo industry of Bihar. Though the indigo area of Madras is far greater in extent, the production of its crop is but little organised. The Bihar crop, on the other hand, is mostly grown by or for European planters, who in some cases finance themselves, in others depend on the help of banks or agency firms. The labour employed is all local and of a rural type, and the manufacturing processes do not involve the use of much machinery. The educative and economic effect of the industry is therefore

small. The interest of the subject, however, lies firstly in the planting system, and in the relations between the planter, as the owner or lessee of land and landed rights, and the ryots who hold under him; these have recently been the subject of special legislation, and it is therefore beyond our province to discuss them; secondly, in the struggle between the natural and synthetic products, in which the former had been, until the outbreak of the war, steadily losing ground. More systematic efforts, however, are now being made to enlist the resources of modern science on the planter's side.

Evidence put before us in Bihar left the impression that natural indigo, if cultivated and manufactured on scientific lines, offers prospects of great improvement, probably sufficient to enable it to hold its own in competition with synthetic indigo. In the following ways opportunities have been neglected in the past, and their recognition thus offers prospects of success, if followed up in the future:—(1) *The application of scientific agriculture*, (*a*) in the adoption of phosphatic fertilisers and other improved methods of soil treatment, (*b*) in the breeding of plant varieties able to withstand the wilt disease, (*c*) in the organisation of seed farms under suitable climatic conditions outside the indigo-growing district, and (*d*) in the rotation of indigo with other crops of marketable value; (2) *The processes of manufacture*, (*a*) in the recent recognition of the fact that the precipitation of indigo is essentially due to a ferment, the cultivation of which under suitable conditions may permit of a great increase in the yield, and (*b*) in the preparation of a standardised product for the market; (3) *The provision of improved financial facilities.*

By careful management under favourable financial conditions several planters have prospered, in spite of the absence hitherto of the advantages which the application of scientific agriculture might bring them, and, although it is impossible to estimate the prices at which synthetic indigo will be placed with profit in future markets, there is no doubt that the prospects before the natural product are sufficient to sustify experimental work and enterprise in organisation along the lines indicated above.

The Railway and Government Workshops.

36. Mention has already been made of the private engineering workshops established to meet the rapid expansion of modern industrial needs, but by far the most important development of mechanical engineering in India is represented by the numerous locomotive and carriage-building shops which are an essential adjunct to the railway system. There are over 70 such shops, and they are to be found in almost every part of India. The largest are the East Indian Railway locomotive shops at Jamalpur with 11,000 hands, the two Great Indian Peninsula shops in Bombay employing nearly 10,000 hands, and the North-Western shops at Lahore with almost a similar total, while the central workshops of the other more important railway systems also employ several

The railway workshops.

thousand men each. It is the business of this army to keep in running order the rolling stock and equipment of the Indian railway lines.

Labour in the railway workshops.

37. These workshops date back to the time when the railways, to which they belong, were first started, and during recent years, in the case of many of the larger lines, they have been practically rebuilt, so that they now represent all but the very latest developments of modern mechanical engineering as applied to locomotive and carriage building. The labour employed is either Indian or Anglo-Indian, supervised and controlled by men brought out from England. Very few Indians have risen to the rank of foreman, and still fewer have been appointed to the superior establishment. With the dearth of Indian mechanical engineers we deal elsewhere; but here it may be remarked that the failure of the railway workshops to turn out such men must be attributed to the lack of provision for training them, and we must add that this deficiency has hitherto been due to the lack of demand for such training owing to the absence of visible prospects for its recipients.

On the other hand, these railway workshops have been the main training ground for engineering artisans of every class, and, owing to the number of skilled foremen and chargemen, they have been most successful in this direction. In most of these workshops some form of apprenticeship exists, and the sons of workmen already employed are encouraged to follow in their fathers' footsteps. Very little has so far been done to provide any form of elementary technical training; but in recent years, the administrations of some of the railways have started classes, with a view of affording instruction to such of their younger workmen as were sufficiently well educated to avail themselves of it. From the railway shops, the artisans often drift into private employment. They also shift very freely from one railway to another, as the conditions of life round each workshop are very similar. The extent to which the country depends upon railway workshops for its supply of trained engineering artisans, however creditable to them, is an unsatisfactory feature of the situation; for, though the work is of a high type, it covers only a somewhat limited range of engineering practice.

Government workshops.

38. Although comparatively few in number, the Government ordnance factories, by reason of the high standard of work turned out in them, are also important centres for the training of certain classes of engineering artisans. These factories are situated at Cossipore, Ishapur, Dum-Dum, Kirkee and Jubbulpore, and each gives employment to several thousand men. Passing mention may also be made of the Marine Dockyards in Bombay and Calcutta and of the workshops maintained on a smaller scale by the Public Works Department to meet its own local needs.

Mofussil Distributing Centres.

Delhi

39. The main distributing centres of India coincide as a rule with the more important railway junctions and are more typical of the comparatively land-locked tracts

than of peninsular India. A description of Delhi will serve as a specimen, but it must be remembered that these centres differ only in size and in the extent of their trade and financial organisation from other distributing centres which are found on a greater or lesser scale all over the country, the smaller ones closely approximating to the market towns in rural areas which we have already described.

The population of Delhi consisted in 1911 of 232,837 persons who, apart from a few old families, relics of the Mahomedan imperial court, and the dealers in and makers of artistic wares, mostly earned their livelihood by the collection, preparation and distribution of manufactured articles and country produce. As in other places, facilities for finance and transport have led to the construction of a few spinning and weaving mills, and others for the manufacture of flour and biscuits and the extraction of oil. The trading community consists of a few Europeans, mostly representatives of large export and import firms with their headquarters at Bombay or Calcutta, managers and employés of local or branch banks and of one or two mills, and a number of Marwari dealers and financiers. There are also some representatives of Indian firms and of Bombay and Calcutta shops. Goods are received on indent or order from Europe or the Indian manufacturing centres of Bombay, Calcutta, Ahmedabad and Nagpur. They consist mainly of piece-goods, yarn, kerosene oil, manufactured or partially manufactured articles of metal (among which sheet and bar iron, brass hollow-ware and sheets, and cutlery predominate), cheap ornaments and trinkets, umbrellas, and so forth. This trade is financed by the nine local branches of the large banks and by the Indian bankers of the city. The imports by rail into Delhi in the year 1916-17 amounted to about 431,000 tons and the exports to about 168,000 tons; among the former, coal and coke, piece-goods, grain and pulse, metals and sugar were the most important, and of the latter, piece-goods, flour, hides and skins and sugar. Small traders in neighbouring towns purchase their supplies from the Delhi dealers, though this practice is being gradually supplanted by the opportunities of direct purchase from Bombay and Calcutta, which better trade information and closer financial relations between different parts of the country combine to offer.

Delhi takes a smaller relative share in handling country crops for export than in the distribution of imports. The buying agencies or sub-agencies of the larger firms, which rail produce direct to Karachi or Bombay are found in all the principal grain markets; and, in respect of the grain and seed crops raised in the vicinity, it is mainly as a market for local export or consumption that Delhi continues to hold its own.

Labour in the Delhi mills.

40. The mills employ the local labour, which is even less specialised and skilful than that of Bombay or Calcutta, and the cotton mills spin only the comparatively low counts for which the cotton of the district is suited. Engineers and fitters find their way here from larger manufacturing centres.

Mofussil Manufacturing Centres.

41. Cawnpore is a town on the Ganges with a population of nearly 200,000 persons. It is served by the main line of the East Indian Railway and branches of the Great Indian Peninsula and the Oudh and Rohilkhand Railways. It owes its origin entirely to European enterprise, having been selected as the site for a factory of the East India Company in the eighteenth century. The situation of the town on the Ganges, just beyond the limits of the kingdom of Oudh, in the centre of a fertile district and on the edge of the main cotton-growing tract of the United Provinces, soon made it an emporium of trade and necessitated military protection, while the subsequent advent of the East Indian Railway did much to develope its growing importance. A large arsenal was established here after the Mutiny, to supply the army with boots and leather goods which were manufactured by Indian contractors. In order to improve the quality of the locally made leather and to avoid the great expense of importation from England, the Government Harness and Saddlery Factory was started here in 1860 on an experimental scale; it proved a success and was put on a permanent basis in 1867. It was no doubt largely owing to the existence of these works that the Government Boot and Army Equipment Factory was started by private enterprise in 1880; it received a considerable measure of Government financial aid at the outset. But the first organised private industry started in Cawnpore was the Elgin Cotton Spinning and Weaving Company, which was founded in 1862. The large quantity of cotton passing through Cawnpore, the financial facilities afforded by an important trading centre, and the cheap labour of the thickly populated areas round, were the chief inducements to its promoters. One factory has followed another, and in 1915 the city contained five large leather factories and a number of small works and tanneries, employing over 6,000 hands in all, six cotton mills with 4,647 looms and 340,000 spindles, employing over 11,000 hands, four tent factories, a very large woollen mill, three sugar factories, and engineering works, a chemical works, two large flour mills, a brush factory, three oil mills, and a number of cotton gins and presses. There is also a central electric generating station supplying both light and power, including that required for working the tramway system.

Cawnpore.

Cawnpore is also an important collecting and distributing centre. Imports amounted in 1916-17 to 599,000 tons, consisting chiefly of coal and coke, cotton, piece-goods, hides and tanning materials, raw and refined sugar, salt, food-grains, oil seeds and metals; exports were 319,000 tons, mostly of raw cotton, piece-goods and yarn, hides, leather, refined sugar, salt, and oil seeds. Its trade, both export and import, is in the hands of several large European branch firms and of a number of Indian merchants and bankers, but the most important industrial undertakings are still controlled by the local European firms, who founded them in the first instance, or took them over at a comparatively early date in their history. One well-known local industrial firm with previously existing large interests in Calcutta subsequently started a branch

in Cawnpore to handle the trade in indigo seed, which was and still is largely grown in the tract between the Ganges and the Jumna.

42. The operatives in the factories, especially in the tanneries and leather works, are mainly *chamars*, who were originally village labourers and tanners. Labour is comparatively plentiful and moves into Cawnpore freely from the densely populated rural districts which surround it. Sample wages in 1918 were as under (in rupees and annas per mensem).

Labour in Cawnpore.

	Rs.	A.
Cotton—		
Grinders and strippers	9	8
Sizers	15	0
Warpers	20	0
Drawers	20	0
Weavers	15 to 30	0
Wool—		
Unskilled labour	8	10
Mule minder	17	5
Piecer	8	1
Leather (Army Boot Factory)—		
Un-hairers and fleshers	12	0
Scourers and setters	12	0
Slicker whiteners	16	0
Machine operators	21	8

More has been done in Cawnpore for the housing of labour by the large industrial concerns in proportion to the numbers employed than in almost any other city in India. Settlements have been established by two companies, providing accommodation of a superior kind for about 4,000 people in each case, at a convenient distance from their factories.

Other Industrial Centres.

43. This account may, we trust, be thought sufficient for our purposes as a sketch of the general industrial position in India. But we are deeply conscious of its incompleteness and, had space permitted, should have preferred to present it in much greater detail. Assam possesses extensive forests and large areas of culturable waste land, and presents important future industrial possibilities to which we have not been able to do sufficient justice. The Madras Presidency, with its varied physical features and wider range of climates than any other province of India, grows a large variety of crops of high economic importance. Although its coast line is of great length with numerous little ports, these are mere open roadsteads, but at the Presidency town the difficulties and dangers of a surf-bound coast have been successfully surmounted. Certain deficiencies in its natural resources have hitherto hindered industrial development, and modern manufactures have grown only to a limited extent. On the other hand, there are numerous towns in which indigenous industries still flourish, and the craftsmen exhibit a high degree of skill and have

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accepted modern methods in many cases. Madura is a centre of extensive weaving and dyeing industries, and Kumbakonam of weaving and of metal-work in copper, tin and brass. The tanning industry flourishes in many towns and has given rise to a large export trade. The possibilities of the Punjab are, it is true, mainly agricultural, but its industries are growing and are spread over many districts. This province possesses special advantages in respect of water power, which are bound to tell in the future, and its people exhibit a natural aptitude for engineering. Turning to the Central Provinces, the city of Nagpur contains a thoroughly up-to-date cotton mill and a large colony of hand-loom weavers, and the manganese field in its neighbourhood has been the principal Indian source of this mineral. In Sind there is the prosperous and growing port of Karachi, which is the chief outlet for the grain exports of northern India. Ahmedabad is an important up-country city which ranks second only to Bombay as a cotton-manufacturing centre. It contains a population of well over 200,000 and no less than 60 cotton mills, which produce nearly one-fourth of the cotton goods made in India; and its oil-pressing industry has made very marked progress in recent years. The mere mention of such important areas and towns is all that we can attempt; but as the main questions dealt with in our report, such as the finance of urban and rural industries, the interdependence of agriculture and industries, the relative efficiency of labour and the conditions under which it works, are perhaps not very dissimilar throughout India, we trust that the specimen descriptions which we have given in this chapter may be accepted as a sufficient introduction to the subject matter of our enquiry. We must however, admit an exception in the case of the province of Burma.

Burma.

14. Conditions in Burma are in many respects different from those prevailing in India, and many of our general remarks are not appropriate to that province, whilst our recommendations have been framed to meet the situation in India as a whole, and must be modified in some measure before they can be applied to Burma.

Agricultural description.

The delta and the lower valley of the Irrawaddy, with their heavy rainfall, produce little but paddy. The villages are far apart and appear even smaller than they are in comparison with the wide stretches of rice fields which, in the fully cultivated districts, lie between them. Gangs of agricultural labourers come over from India for the cultivating season, and thereafter work in the rice mills; but this state of affairs is found only near Rangoon. Throughout the rest of Burma the people of the country carry out the operations of agriculture, and have extended the cultivated area with striking rapidity. The result is that the country can at present export annually some $2\frac{1}{2}$ million tons of rice from an area of little over 10 million acres under paddy, a position which the natural

increase of the population, especially if accompanied by a diversification of cropping, may in course of time materially modify.

The middle section of the Irrawaddy valley comprises what is known as the dry zone, with a rainfall not exceeding 40 inches and often less. Here paddy is confined to low-lying or artificially irrigated fields, and is a more precarious crop than in the regions of heavier rainfall. Cropping is more diversified, and includes cotton in places, sesamum, and various beans and pulses, usually grown as sole crops. Except in the neighbourhood of the larger towns there are no roads, and the chief means of communication are the river and its creeks and, to a less extent, the railways. We did not visit the portion of Burma lying above Mandalay, where the rainfall is again higher and paddy once more predominates. The excessive dependence of Burma on the paddy crop is a very marked feature of its agriculture. Even from this point of view, such dependence is undesirable, and a greater diversity of cropping would place agriculture on a wider and, therefore, a safer basis, and almost certainly provide raw materials such as cotton, jute, sugarcane and oil seeds for local industries. Considering the great task of agricultural education and development that awaits it, the local Department of Agriculture is conspicuously lacking in equipment, and possesses practically no organisation for the training subordinate staff.

Forests.

45. Even in the plains and valleys there are wide areas of forest, consisting of teak and other species, usually far from homogeneous : in the hills, the unending jungle is only occasionally broken by clearings and villages. The reserved forests cover nearly 29,000 square miles, which yielded in 1915-16 only one cubic foot of timber per acre. The unclassed forest areas, of about 114,000 square miles, are awaiting further development, either by their systematic exploitation as forests, or by being opened up for agricultural colonisation. The gross revenue from this vast property is at the rate of about eight annas per acre of the reserved forests, and the expenditure amounts to about four annas. Obviously, there is room for enormous development. Alongside of the numerous tributaries and creeks a fair amount of timber has been extracted, mostly teak, which, being lighter than water, is easily floated out in rafts. The very valuable hardwood timbers have scarcely been touched, except in the case of a few species, and these only to a limited extent and mostly for local consumption. The timber for export is mainly teak and is almost entirely removed by private firms who hold 15-year renewable forest leases. Such temporary roads and railways as are required are put down by these firms. The possibilities of the forests are thus not only inadequately exploited, but are imperfectly known, and the evidence tendered to us goes to prove that the expert forest staff requires reinforcement even more urgently than in India.

Organised industries.

46. Among the organised industries of Burma are paddy milling, the timber trade, the extraction and refining of mineral oil, and various other mineral ventures, the most important of which in their ultimate bearing on the

industrial development of India generally, are the winning and treatment of the lead, silver and zinc ores of the Bawdwin mine in the Northern Shan States, and the wolfram and tin mining of southern Burma. The preparation of rice, timber and oil for export and consumption mainly centres in Rangoon, which is the capital and the main port of Burma and is conveniently situated for the receipt of produce from the railway and the Irrawaddy river alike. The trading and industrial population of Rangoon is, to a striking extent, non-Burman. The export and import trade is in the hands of European, Chinese and Indian firms. and the industrial processes are mostly carried on under European supervision and with European capital. The latter remark applies also to the extraction of timber and oil and to the mining industry generally. The fact that most of the industrial and trading operations of Rangoon are on a large scale has prevented the Burman hitherto from taking any prominent share in them, and the great increase in agriculture has hitherto absorbed most of his energies. Except in those towns which are based on trades or industries of modern growth, the urban population is, speaking generally, not gaining ground, a fact which is in its turn due to the large areas of fertile waste land hitherto available to the settler. The absence of congestion in the quarters occupied by the operative classes in Rangoon is a welcome feature which deserves note in passing.

Small and cottage industries.

47. The small indigenous industries consist of weaving (mainly silk), wood carving and carpentry, lacquer working, metal working and pottery. They present several features widely differentiating them in character and organisation from the corresponding industries in India. Considering the size of the industries themselves and the number of persons engaged in them, a relatively large proportion of the articles produced appear likely to command a sale in other parts of the world. Whether this is due to the greater skill of the Burman artisan, to his distinctly higher standard of comfort, or to the fact that his indigenous arts have so far been less affected by the penetration of western manufactures, it is difficult to say.

Women in Burma take a large share in domestic industries; they weave ornate fabrics, and carry out with their own hands many of the most difficult and skilled processes in other industries. Incidentally, they perform for their own households the work done in India by barbers, washermen, water carriers and the like. Another very noteworthy feature and one which should facilitate measures for the improvement of many minor industries, is the fact that the village artisan is not, as in India, part of the village system. Weavers, it is true, tend to form separate colonies in most parts of the world, but in Burma potters, blacksmiths, carpenters and cobblers are found in groups, which supply areas limited only by the portability of the article made in relation to its value.

Although the Burman does not compete with. or to any large extent invest in. the considerable organised industries of Rangoon, he is far

from backward in establishing small rice, timber and oil mills further up country, a branch of development which may be expected to expand as the more fertile waste areas come gradually under occupation. The Burman has no prejudices or traditions to deter him from industrial work, and there was evidence forthcoming to show that, although inexperienced in business and account keeping, he has distinct possibilities as an industrialist.

A serious handicap to local trade and industries up country is the absence of banks; for instance, the only branch bank in the Irrawaddy valley is one at Mandalay. The financing of trade and of such industries as exist is in the hands of Madras Nattukottai Chetties, who charge very high rates of interest, and replace their agents as a regular practice every three years, which is apt to tell hardly on their clients. Co-operative banking has been pushed relatively further in Burma than in any other Indian province, and extends not only to credit, purchase and distribution, but even to production, *e.g.*, of sleepers and road metal by Burman petty contractors, who were previously in the hands of Chetties; whilst evidence placed before us showed that in one district a small agricultural bank had achieved considerable success.

Lack of coal.

48. There is, however, one striking natural deficiency in Burma to which we must refer. Although the country has not been fully explored by geologists, it seems probable that it contains but little coal, and that mostly of poor quality. For fuel, the local industries must either pay the high price of imported coal, burn wood, or use oil. Wood will probably come into more extended use in future through more economic processes, but timber has a competing value in other ways. The existing oil fields are also being rapidly drained, and the new ones that have been tested, show no signs of replacing the three main fields of Yenangyaung, Yenangyat and Singu. Thus, for the future, Burma must look to the greater utilisation of water power, and here, as in India proper, it is desirable to organise a hydrographic survey, so as to be ready to meet industrial demands of the future.

CHAPTER III.

Raw Materials for Industries.

Agricultural Products.

Agricultural products as a basis or Industries.

49. In order to complete this general picture of the industrial position in India, it is necessary to give a brief account of the raw materials and natural facilities available.

Although it must be clearly recognised that Indian industries are now, and will be in future, chiefly based on the agricultural products of the country, we find that, important and valuable as they are, much still requires to be done for their development. The extent to which they are manufactured whether for export or internal consumption, instead of being sent out of the country as raw materials, can, in some cases, be largely increased ; and the Agricultural Department will find great opportunities and sometimes an urgent necessity of improving the output and quality of many Indian crops. In the case of cotton, a note appended to this report (Appendix B) will show the Indian and world position of this crop. The quantity of short-staple cotton raised is much larger than is necessary to supply the demands of the Indian mills, and a surplus is available for export, which foreign countries readily take. At the same time the Indian mill-owners are beginning to feel that, if they are to enjoy an appreciable share of the more profitable trade in finer goods, more long-staple cotton must be grown in this country. The external demand is mainly for raw cotton and is rendered effective by the imposition of tariffs in the importing countries, which has severely restricted the development of the Indian export trade in cotton goods. The note also illustrates strikingly the necessity for further botanical research. It has been left in its draft form, as it has already been seen unofficially by the Government of India, by whom it was used to support their proposals for the appointment of the Indian Cotton Committee of 1917-18.

Cotton.

Sugarcane.

50. Turning to sugarcane, although India possesses a larger acreage under this crop than any other country in the world, her imports of sugar have grown in recent years with very great rapidity, and, before the war, were exceeded only by those of cotton manufactures. The obstacles in the way of increasing local production lie mainly in the poor type of cane and the inferior cultural methods in the principal cane areas, the United Provinces, Bihar, Bengal and the Punjab ; and in the very small holdings on which cane is grown, with the consequent impossibility of securing the regular supply requisite for a modern central factory. The position has been examined in a separate note (Appendix C).

Cotton has recently been the subject of attention by the Government of India, owing doubtless to its importance from the point of view of the world supply. But sugar is of almost equal interest to Indian consumers, and may, we have shown, prove the foundation of a great Indian industry. We think that the facts which we have collected regarding these two crops, though they include nothing that is not already well known to students of the subject, are sufficient to prove the necessity for a close investigation of Indian industrial crops, and for the creation of scientific and industrial departments of Government fully equipped to carry on such work. Rich results are already being obtained from the work of the Agricultural Department; but hitherto, owing to the lack of staff, there has been no concentration of effort on the crops which afford products suitable for local manufacture and are, therefore, potential creators of wealth for other classes than the agriculturist.

Fibre crops other than cotton.

51. Among fibre crops, in addition to cotton, there are jute, *sann* hemp (Crotalaria juncea), Bimlipatam jute (Hibiscus cannabinus) and various others of less importance. Jute is already very fully exploited from an industrial point of view, though many possibilities exist of the improvement of the crop itself. About half the crop is manufactured in the country, enough to cover its internal needs many times over. Of the other fibre crops, there is little or no organised manufacture in India at all. Although these are far less important than jute or cotton, they have in some cases valuable qualities, and can be made into articles for which there is a ready demand. There are also fibre crops such as sisal hemp, flax and rhea, which, though suitable for India, are either not grown in the country at all, or only to a very limited extent, and some of these, such as flax, are required for manufactures of national necessity.

Oil seeds.

52. Oil seeds are extremely important, both from the agricultural and from the export point of view. The areas covered by the principal oil seeds and the pre-war value of exports are shown below.

Crops.	Area in 000 acres. 1913-14.	Value of exports Rs. 000. 1913-14.
Castor	Not shown separately.	2,05,00
Copra	Ditto.	1,55,06
Cotton	15,844	2,12,51
Groundnut	463	4,88,1
Linseed	2,268	6,68,71
Rape and mustard	4,083	4,47,37
Sesamum	4,278	2,70,43
Total non-essential oil seeds . . .	14,658*	27,50,06

* Excluding copra and cotton.

A very large proportion of the produce is exported; much of the balance is crushed either by small power plants or in country bullock mills, the latter of which are very inefficient in oil extraction. The few mills of more modern type have found great difficulty in marketing their cake locally, and have also, in some cases, made serious mistakes in their technical management or business arrangements, in the absence of proper advice. Little has been done hitherto by the over-burdened Agricultural Department to improve the local types of oil-producing plants or to investigate the conditions under which the oil is formed in the seeds. The methods of oil extraction have been equally neglected, and we recommend that this important matter should be examined by the experts who, we hope, will be available in the future. We recognise that the success of large-scale mills producing oil for export depends not only on the skill with which they are worked and on improvements yet to be effected in the means of transport (such as possibly the adoption of carriage in bulk), but on an even more important factor—the tariff policy which may be pursued in India and elsewhere. The proposals that we are making to provide scientific and economic assistance should enable increased attention to be paid to the improvement of Indian crops, and our recommendations regarding the provision of facilities for the purchase of machinery and plant should lead to a great development in the methods of preparing them for the market.

Hides and leather.

53. In the case of hides, it is a well-known fact that the majority of these were before the war exported to Germany, and that the export hide market of Calcutta was entirely in the hands of German firms or firms with German affinities, who were bound by trade arrangements to sell to the continent through a ring of German dealers at Hamburg and Bremen.

In Madras, the export of raw hides is negligible, but large quantities of both hides and skins are shipped in a lightly-tanned condition. As a result of the measures introduced since the outbreak of war to stimulate the export of 'East India kips,' as these hides are called, this industry has made a considerable advance. In Bombay, there are a few tanneries which prepare hides for shipment in a similar fashion. In addition to the valuable trade in raw hides from Calcutta, large quantities were also exported in a raw state through Karachi and Rangoon. The export of raw skins is considerable from all ports, especially from Bombay, Karachi and Calcutta.

The village tanner finds that the continued rise in prices is placing local hides to an increasing extent beyond his reach. His methods are in any case extremely inefficient; he has been justly described as 'making a good hide into bad leather'; and there seems little hope that his industry can or will ever deserve to be saved. The organised tanneries vary in size and efficiency from large concerns employing upwards of 2,000 hands even before the war, to the numerous Indian-managed tanneries, the smaller of which employ only a few dozen men. The principal difficulty at present is the lack of organisation and expert skill.

Chrome tanning so far has made comparatively little headway in India, chiefly owing to the fact that its processes are highly technical, requiring chemical knowledge and an elaborate equipment of machinery. Progress in recent years, however, especially since the outbreak of war, has been more rapid, and considerable quantities of special forms of chrome leather, for which the Indian hides are particularly suitable, have found a ready market in London.

Vegetable tanning materials of good, though unequal, quality are found in most parts of India. The two chief agents used hitherto have been *babul* (Acacia arabica) and *avaram* (Cassia auriculata) bark. *Dividivi* (Cæsalpinia coriaria) and myrabolams (Terminalia chebula) are in local demand and are also very largely exported. Mangrove bark is available in Bengal and other places along the sea-coast. Numerous other trees and shrubs are also used in different parts of the country by village tanners, and their properties are now (1918) being systematically investigated under the orders of the Indian Munitions Board. But the machinery for the collection of vegetable tanning agents is not at present sufficient to produce a supply adequate to the largely increased demands which arose, owing to war conditions, in the year 1916 and onwards. The preparation of tannin extracts has been tried from time to time, and generally without much success, but the conditions under which such attempts have been made were not satisfactory, and should not preclude further work in this direction.

54. Here, again, the exclusion of the question of tariffs from our terms of reference renders us unable to recommend any complete scheme for dealing with the situation; but we are decidedly of opinion that an important feature of any such scheme must be the extension and improvement of the tanning industry, both in respect of the lightly-tanned hides of Madras and the completely tanned and curried leathers of the large Indian tanneries in Cawnpore, Bombay and elsewhere. We recognise that, among other initial difficulties, this industry will be exposed to the risk of organised competition from hide exporters. It must, therefore, in any case be established on a considerable scale, though it will be impossible for India to tan all her own hides for some time to come. We also recognise that India will, for an even longer time, be unable to consume all the leather that will be produced by an extension of the industry on a scale sufficiently large to withstand the competition of exporters of hides, while tariff bars against the importation of leather exist in many foreign countries which admit hides freely.

In view of the importance of the question, we have prepared a separate note (Appendix D), discussing the position in detail and embodying certain definite proposals.

Minerals.

India's mineral resources.

55. The nature and extent of the mineral deposits of India have been systematically examined by the Geological Survey Department, although it has been

impossible for it, with limited funds for establishment and prospecting equipment, to carry its investigations, except in very special cases, to a point which would warrant commercial exploitation without further detailed enquiry. The mineral deposits of the country are sufficient to maintain most of the so-called "key" industries, except those that require vanadium, nickel and possibly molybdenum.

It is unnecessary here to repeat in any detail information which is already available to the public in the records of the above department. As has already been shown, Indian coal is very unevenly distributed and generally poor in quality. The deficiency is especially noteworthy in the case of Madras and Bombay. Iron ore is found in many parts of the Indian continent, but the instances in which ore of good quality exists in suitable proximity to satisfactory coal supplies are not very numerous, though sufficient in all probability to warrant large extensions of the existing iron and steel works. A rich deposit of lead and zinc ore exists in the Shan States of Burma, but, although the mine is in active operation, no attempt has hitherto been made to smelt the latter metal in India. The copper ores of Singhbhum, a district of Chota Nagpur, have as yet scarcely been exploited, although a mine has been developed and smelting works have been erected and have already started operations. High-grade chromite is produced in large quantities in Baluchistan. The bauxite deposits of India, the best and largest of which are found in the Central Provinces, were made known to the public by the Geological Survey some years ago, but have not yet been used as a source of aluminium. Manganese ore is extracted in very large quantities in the Central Provinces, and to a less extent in Chota Nagpur, Bombay, Mysore and Madras. At present it is mainly exported in a raw state to other countries, although the two existing iron and steel companies have, since the war, manufactured considerable quantities of ferro-manganese.

South Burma is one of the richest sources in the world of tungsten ores, occurring in the form of wolframite, the best known ore of this metal, which has now become almost indispensable to mechanical engineering as an ingredient in "high-speed" steel. Tin is also found there and in other parts of Lower Burma, and successful dredging operations are carried on in Tavoy. Ores of antimony are found in the Shan States, in Tenasserim and in Mysore, but none of these has yet been successfully exploited.

Mica.

56. India also takes the first place among the mica-producing countries of the world. The Bihar mica is of the highest grade so far raised in large quantities. The mineral was, until recently, won almost entirely by small workings but some of the larger firms interested are now beginning to apply more scientific methods. Micanite has already been made experimentally at Kodarma, and works will probably be established on a permanent basis before long ; it is also manufactured in the East Indian Railway workshops at Jamalpur.

57. Cement works have been started at Madras, Bundi, Porbandar and Katni. The factories are equipped with plant of modern design, and the quality of the cement produced is officially reported to be satisfactory. They are, however, only able to meet part of the Indian demand, and though the cost of manufacture is believed to be low, the price of this commodity to the public is still controlled by the rates at which it can be imported. A sufficient reduction in the price of cement would lead to a great extension of its use, especially for lining irrigation canals and channels with the object of preventing waste of water.

Cement and pottery.

Experiments in the suitability of various clays for pottery purposes have recently been conducted in the Bombay School of Art and elsewhere, with results that should be made more widely known.

58. Sand and lime suitable for the manufacture of glass occur in many parts of India, but hitherto only partial success has attended the working of the few glass factories that have been established, while failures have been frequent. But it by no means follows that glass cannot be successfully made in India. What has been most conspicuously lacking hitherto has been a complete and systematic investigation into the economic possibilities of glass making in the different parts of India, including the price of fuel and raw material, and the distance and extent of markets. The prospects and position of the glass industry in India generally form the subject of a separate note (Appendix E), which clearly demonstrates the necessity of considering not only the economic but also the technical side of a new venture, and of employing a number of specialised experts before taking up a complex industry.

Glass.

59. India possessed at one time a practical monopoly of saltpetre, which is found in the plains of Bihar, the United Provinces and the Punjab, and extracted and refined by indigenous methods. Owing to its occurrence in admixture with salt, its preparation has hitherto been safeguarded by various excise precautions, which are alleged to have weighed heavily on the industry, though it has expanded greatly under the stimulus of increased prices during the war. Indian saltpetre had previously been supplanted to a large extent by the potash mines of Germany and the nitrate deposits of Chili. A separate note on this industry also (Appendix F) is attached to this report.

Saltpetre.

Forests.

60. The area of forests under the control of the Forest Department in 1915-16 was 249,000 square miles, of which 99,205 square miles were reserved. The total outturn was 286 million cubic feet of timber and fuel, and minor produce valued at Rs. 116 lakhs; of these 179 million cubic feet and Rs. 88 lakhs worth of minor produce came from the reserved forests. This gives a yield per square mile of 1,149 cubic

The extent and value of the Government forests.

feet of timber and fuel, and minor produce valued at Rs. 47 from all classes of forest; and a corresponding yield of 1,809 cubic feet, and Rs. 90 worth respectively from reserved forests only. For the forest produce of Native States, no complete figures exist. India imported 96,000 tons of timber valued at Rs. 74 lakhs in 1913-14, the last year before the war. In spite of freight difficulties, there has not been much relative decline under this head during the war years, a fact which shows the necessity to India, under present conditions, of these imports. Against this (according to Statement No. XV of the Statistics relating to Forest Administration) the exports of forest produce in the same year were valued at Rs. 454 lakhs. The largest items of this total, *viz.*, caoutchouc (Rs. 79 lakhs) and lac (Rs. 196 lakhs) are by no means exclusively, or in the former case even chiefly, derived from Government forests; the principal export which can be assigned wholly or mainly to this source was teak, valued at Rs. 78 lakhs. The value of other timbers (excluding sandalwood) was only Rs. 7 lakhs.

The following figures illustrate the financial aspect of forest management. In addition to forest produce removed free or at reduced rates, valued at Rs. 85 lakhs, the total receipts of the Forest Department for the year 1915-16 amounted to Rs. 310 lakhs, and the expenditure to Rs. 178 lakhs, yielding a surplus income of Rs. 132 lakhs. The expenditure on roads and buildings was just under Rs. 12 lakhs, though in the last year of peace it amounted to Rs. 18 lakhs. To these figures should, presumably, be added a share of the cost of the supervising staff shown under the head of administration; but, on the other hand, a large amount of the expenditure must presumably have been on account of maintenance of existing works. The importance of these figures arises from the strong evidence received by us in many provinces of the inadequacy of the forest staff for the work of exploitation and commercial development, especially in the higher grades, and of the urgent need for improved forest communications. The expenditure on the Imperial Forest College and Central Research Institute was only Rs. 2·87 lakhs, much of which was, moreover, incurred in the training of recruits for the department.

Incomplete use made of forest resources.

61. As the above figures will have shown, the national forest estate is of vast extent and value; but a scrutiny of the output per square mile proves that its actual yield has hitherto lagged far behind its possibilities, and is, in most areas, greatly in defect of what the natural increment must be. The chief needs of the Forest Department are undoubtedly the development of transport facilities; the exploitation of the forests on more commercial lines; and the extension of research and experimental work which should, when necessary, be carried out on a larger scale and under commercial conditions. All these deficiencies point to the necessity for more staff.

Turning first to the question of communications, we find that those portions of the forest estate which are favourably situated for export, for industrial exploitation or for the very important agricultural demand,

have been utilised fully, sometimes too fully, but generally, in the absence of a proper system of transport, not on the most economical lines. The same lack of transport facilities leaves valuable and extensive areas of forest, especially in Burma, in Assam, in the Himalayas and in the hilly tracts of the west coast, very largely unexploited, while quantities of timber are imported by sea from distant countries. The difficulties of transport in these forests, remote from commercial centres. are great. Many valuable timbers do not float, while water carriage of those that do is rendered difficult by the intermittent nature of the streams in many parts ; or by obstructions in the hill sections of rivers with a perennial water supply. In most forest areas, railways, ropeways and tramways are non-existent, whilst even passable cart roads are often wanting. Difficulties of these kinds have, however, been successfully overcome in other countries, and we see no reason why they should not be conquered in India also. We understand that, to deal with special problems of this nature, the Government of India are contemplating the recruitment of a number of forest engineers from countries where forest engineering is practised on a large scale, and have held that ordinary work such as the construction of roads, buildings and simple tramways can be carried out by the forest staff, with such assistance as may be necessary from the local Public Works officers. To the first of these propositions, as a temporary measure, we desire to lend our hearty support ; but as regards the second, we consider that the heavy routine duties of the existing superior forest staff, in connection with the conservancy and improvement of the forests and the exploitation of their produce, render it impossible as a rule for such officers to devote time to the question of transport facilities. It would be more economical to employ a full staff of forest engineers, in which experts in special forms of forest engineering would eventually be included, graded in such a way as to make the prospects of such a separate branch of the Forest Service in itself sufficiently attractive. We propose below that the extraction of some classes of forest produce should be undertaken through the agency of this staff.

62. Another important deficiency to which we desire to draw attention is the absence of information of commercial value regarding the products of the forests and of commercial methods in rendering them available for industrialists. We would refer specially to the advantages which would arise from putting the timber on the market as far as possible in the form of standard scantlings. In certain cases, especially in Burma, the exploitation of timbers has been handed over to private agency on long leases : the Forest Department claims that such an arrangement is pecuniarily disadvantageous to Government, and there is evidence to show that private firms are unwilling to remove or unable to find a market for the less known timbers which are usually too heavy to float. We consider that Government should have at its disposal a staff which will enable it to play a more direct part than hitherto in the exploitation of its own forest estate, in order to obtain a larger share in the yield thereof and to ensure a fuller use of the many valuable species hitherto

untouched. The members of this staff need not be trained silviculturists; they would be generally guided in their selection of timber for removal by the direction of highly qualified officers of the regular forest staff, under whose orders they would work. They should be capable of judging whether a particular tree is in a condition that will repay exploitation; but for the rest, their work in organising the removal of timber would be a form of engineering, and would bring them into intimate touch with transport questions. They might thus suitably form part of the service of forest engineers which we have just proposed. They would not be directly concerned with the selling price or the marketing of timber, matters which would be dealt with by selected forest officers on lines suggested by us below. It will, of course, be understood that the employment of special men for the collection and removal of forest produce will only be necessary in certain special cases, where the value of the timber and the difficulties in the way of its extraction warrant such a course. Due provision should be made for the future training of Indians in this country as forest engineers for ordinary and for special classes of work.

Timber removed under Government agency, otherwise than to fill definite orders or for local consumption, will require, especially in the case of the less known species, special arrangements to bring it to the notice of consumers and render it available for them. The officers controlling depôts established for this purpose should be selected for their commercial aptitude, and should keep in close touch with the various Departments of Industries and through them with consumers.

Necessity of a link between research and commercial exploitation.

63. In respect of the third requirement of the department, research and experimental work, we consider that the equipment of the Forest Research Institute at Dehra Dun is wholly insufficient. We observe that the Inspector-General of Forests is of opinion that the staff should include (1) a wood technologist, (2) a pulp expert, (3) a tan and dye expert, (4) a minor produce expert, to be employed on research work only. We agree generally with these suggestions, so far as they go, and we propose in Chapter IX a scheme in accordance with which suitable specialists will be available for research in these subjects. Something more is, however, needed; there is a very marked absence of a practical link between the work of the laboratory experts at the Forest Research Institute and the development of successful commercial undertakings. A forest economist was appointed to supply this link, but the difficulties of the position and the variety and extent of the duties which have fallen to the lot of this officer were at the outset inadequately estimated. At present he has only one assistant and has to share with the other research officers the services of a single chemist. The Forest Economist is expected not only to have a basic knowledge of forestry, but to know enough of the chemical, drug, oil and other trades to give adequate answers to all sorts of miscellaneous enquiries, as well as to detect and follow up promising raw materials. The present arrangement by which a single officer is detached for a task

that requires the knowledge of a dozen specialists, is not only unfair to the individual but eminently unsatisfactory to the department.

Failures to develope industries dependent on forest products.

64. Several instances have been brought to our notice illustrating the possibilities of the commercial development of various descriptions of forest produce on new lines; and the failures and successes recorded seem, in our opinion, to point clearly to the correct solution. We will first therefore briefly describe them and then formulate our proposals.

The Bulletins of the Forest Department are often of great value, but one issued some years ago regarding the suitability of Indian timbers for match making has been cited feelingly by several witnesses, as an example of the danger of recommendations based upon incomplete enquiries, especially in the absence of data obtained from actual practical experience.

Some preliminary work has apparently been done in connection with the antiseptic treatment of timber. But we believe that this has not been carried out on a scale and under conditions that will give results on which action can be taken commercially.

Very definite recommendations have been made as to the suitability of bamboos for the manufacture of paper pulp, and excellent paper has been made from such pulp; but even before the war, business men were obviously reluctant to develope the concessions that they had obtained. So far as can be ascertained, the reasons for this hesitation were the lack of adequate information regarding the cost of transport of the raw material and doubt as to the capital outlay necessary on plant and machinery, coupled with uncertainty as to the cost and quantity of the chemicals required in the manufacturing processes. Finally, there was a fear lest the infant undertaking might be crushed by the dumping of wood pulp from Scandinavia or North America, and there was the knowledge that Japanese experiments in this direction had not proved successful. The position of paper pulp in India after the war will undoubtedly depend very largely upon the manufacturing conditions in other countries, upon fiscal regulations and upon the cost of transport overseas. It would appear, therefore, if the above line of argument is correct, that we have here a good case for a Government pioneer factory. It might or might not prove commercially successful; but it would certainly, if properly managed, provide adequate data to determine the commercial possibilities of the bamboo as a source of paper pulp, when normal conditions are re-established.

The history of the attempts to establish wood distillation in India also indicates the desirability of an organisation for commercial experiment, such as is now under discussion. The subject was independently taken up by the Director of Industries in Madras and by the Superintendent of the Government Cordite Factory at Aruvankadu. Later on, these two officers co-operated; but their proposals were generally viewed by the Forest Department with misgiving, and no useful assistance was

rendered. The subject of wood distillation has been treated throughout as a matter of academic interest rather than as one of vital importance. The result has been that India has failed to establish an industry which, at the present time, would have been of the greatest national value.

We see, therefore, that some link is needed between the research officers and the commercial public, to create confidence among the latter in the results obtained by the work of the former. The type of mind best qualified to undertake scientific research is probably the least adapted to deal with commercial matters.

Success of correct methods of pioneering.

65. Instances of the correct method of dealing with problems of this sort, however, are not wanting, and in two cases at any rate success has been achieved, though here too their history confirms us in our views as to the necessity for close co-operation between the preliminary scientific research and the subsequent commercial development.

The beginnings of the present resin factory at Bhowali in the United Provinces, date back some 27 years. We understand that it received assistance in its later stages from the Research Institute ; but originally in the absence of any officer with an expert knowledge of turpentine distillation, it was developed on a system of trial and error, with consequent waste of money, and is even now far from satisfactory. On the other hand, the factory at Jallo, near Lahore, has attained a much greater degree of success in a far shorter time, not so much from any help it derived from the experience of the Bhowali factory, as because the officer who was to design and work it was given the opportunity of acquiring expert knowledge of turpentine distillation under commercial conditions in other countries.

Before leaving this subject, we desire incidentally to draw attention to the fact that both the turpentine and the rosin produced at these factories differ in chemical constitution from the corresponding substances produced elsewhere, and to the opportunities presented by this fact for a fresh series of researches to discover the precise nature of these differences, and whether these may not perhaps indicate the existence in the Indian products of substances of special commercial value. The continuance of research in such cases is most desirable, not only in the hope of fresh discoveries, but in order to forestall possible competition.

66. Reference may also be made appropriately to the success achieved in the distillation of sandalwood oil by the Mysore Government. In this case, the work was initiated by the State Department of Industries consequent upon the dislocation of the trade in sandalwood, which ensued soon after the outbreak of war. The preliminary investigations were made by the Director of Industries with the assistance of the staff of the Applied Chemistry Department of the Indian Institute of Science. It was necessary to get results quickly, and the resources of both the State Department and the Institute of Science were concentrated on the problems which arose. Subsequent developments, due to the prolongation of the war and the enormous rise in the cost of transport overseas,

have rendered this venture, for a time at any rate, extraordinarily profitable. It is understood that sandalwood distillation was also under enquiry in the Forest Research Institute, as the matter is of considerable interest to the Forest Departments of both Madras and Coorg; but the Economic Branch of the Institute was ill-equipped to undertake the preliminary investigations, and was further not in a position to carry them out on the scale necessary to create confidence and so warrant an investment of either public money or private funds in the establishment of the industry.

The Forest Department has considered the possibility of utilising tan stuffs, and the Inspector-General proposes the appointment of an expert for tans and dyes. Work is, however, already going on in connection with the organisation for improving the tanning industry under the Indian Munitions Board, for the preparation and testing of tannin extracts on a commercial scale; and this close connection between the laboratory and the tannery seems to be the correct method of tackling the problem.

Conclusions.

67. Although there is much that can be done by the Forest Research Institute in discovering possible products of value, in obtaining and disseminating information regarding their distribution and quality, and in testing them in the laboratory, it seems clear that an organisation of a different nature is required to ascertain the results of treating them under commercial conditions. It is not necessary that this organisation should be attached to the Research Institute or even in all cases be managed by the Forest Department, so long as the necessary touch can be maintained. It is here, we consider, that Departments of Industries will be able to co-operate with the Forest Department, either by establishing pioneer factories, or, where these are not necessary, in placing the data obtained by the research officer before the industrialist in a way which will elicit his support. In other cases, the suggestions put forward by the Forest Research Institute might be taken up by other suitable departments or by private agency direct.

Necessity of plantations.

68. There are certain special industries such as the manufacture of pencils, matches, tea boxes, both ordinary and three-ply, and packing cases, which require a continuous supply of suitable timber within a reasonable distance from the factories, this distance depending on the method of transport. As the species suitable for these industries do not as a rule occur gregariously, their concentration in plantations is strongly to be recommended. We understand that the Forest Silviculturist and local officers are engaged in studying the habits of these species, and that the formation of such plantations has been commenced in Bengal and Assam. Similar measures have been very effective in the case of fuel plantations of casuarina on the east coast and elsewhere in Madras, where the example has been largely followed by private enterprise. We have dealt further with a

particular aspect of this subject in Chapter VI, where we discuss the various sources from which power can be provided for industrial purposes.

Fisheries.

69. Striking evidence was also put before us regarding the immense future which awaits a more active development of Indian fisheries. It has been abundantly demonstrated by the few investigations that have hitherto been conducted in Madras and Bengal into the possibilities of deep-sea fisheries, by trawling, netting or line fishing, that a very large supply of food can be obtained from this source. The dearness and irregular supply of fish in many cities and towns within a reasonable distance from the coast is a subject of general complaint. The fishermen are usually men of low caste, ignorant, idle and uneducated, with a low standard of comfort. They are mercilessly exploited by middlemen, whose exactions lessen the supply of fish and add greatly to its cost. In inland waters, various causes, such as the use of certain types of nets and fish traps, and the destruction of fish by the periodical emptying of irrigation channels, have had a most injurious effect on both the quantity and the quality obtainable.

Indian fisheries and their development.

70. The Madras Fisheries Department has shown that much can be done to improve the methods of sea fishermen in drying fish and preparing fish oil and fish manure. As a result of its exertions, some 250 small fish-oil factories have been established along the coast, mainly by the fishermen themselves; and still further improvements in the preparation of the oil have been worked out by Sir F. Nicholson, the Honorary Director. The possibility of preparing tinned and cured fish of high quality has been amply demonstrated on a commercial scale. Co-operative societies have been started among fishermen, and seem likely in course of time to prove both successful in themselves and valuable in developing a sense of self-respect and a higher standard of comfort among their members. Much experimental work has also been done in connection with the stocking of tanks, rivers and canals with fresh-water fish and the cultivation of certain species in lagoon waters offers very promising prospects. We think that the Fisheries Department deserves even fuller support from Government, especially in the further development of deep-sea fishing. The capture, preservation and transport of deep-sea fish require investigation and demonstration on a commercial scale. An organisation for the marketing of the fish will also have to be provided. Owing to the present uncertainty of the results and the various difficulties interposed by the strong position of middlemen, the absence of refrigerating storage and other causes, there are many obstacles to overcome, and private enterprise is not likely to enter this field, until Government has fully shown the possibilities of the industry and expert employés are available. The only attempt of which we heard to establish a private industry in fish on modern lines in this province, met with

Work of Madras Fisheries Department.

disaster owing to ignorance of local conditions, and the example is likely to prove deterrent unless Government leads the way.

The superior staff of the Madras Department consisted in 1917, in addition to the Honorary Director, of two Europeans, the marine and piscicultural experts, and three Indians, an oil and soap chemist, an assistant to the piscicultural expert and an Assistant Director, a highly educated Indian gentleman, himself of the fisherman caste, with European scientific training. The extension of the operations of the department will, it may be expected, lead to the training of a number of additional experts, whom private companies, when formed, will no doubt be glad to engage. The total expenditure on the department in 1915-16 was Rs. 1,83,000 against receipts of Rs. 1,35,000; the bulk of the latter, however, were payments in respect of certain fishing rights which the department administers.

Fisheries in other provinces.

71. The Bengal Department of Fisheries, which was till recently under the control of the Director of Agriculture, has at its disposal an amount less than a quarter of that expended in Madras, and employs only a European piscicultural expert and two Indians. The work of the department has hitherto consisted mainly of a general enquiry into the conditions of fish life and fisheries in Bengal and Bihar and Orissa; a few co-operative credit societies have been started, and various special enquiries have been made: but the impression left on the Commission was that the department was seriously in need of staff and funds, and that little satisfactory progress was likely on existing lines. There is no reason to believe that the possibilities in Bengal waters are in any way inferior to those which the Madras department has shown to exist; but in Bengal, as in Madras, the fishing industry is carried on under very bad conditions. Organised private enterprise has not so far taken up the industry with any success, and the department appears to be out of touch with what little exists. We are very decidedly of opinion that the development of fisheries in Bengal should be taken up fully and energetically, and that the executive staff of the department should be considerably improved and strengthened.

We may remark that the Bombay and Burma Governments do not possess any Departments of Fisheries; and we would suggest that they might well consider the desirability of establishing them. The latter Government in particular draws a revenue of some Rs. 30 lakhs from fisheries.

Conclusions.

72. We see no necessity at this stage to propose the creation of an imperial Department of Fisheries, but we think that the proposals that we are making regarding the organisation of scientific services will have a most important bearing on the improvement of fisheries in India. To furnish each of the larger provinces with the necessary complement of scientists would involve undue expense, and an incomplete equipment would be useless; more-

over, there are several large river systems which extend into two or more provinces, and the fish which frequent them cannot be studied satisfactorily by a purely provincial organisation.

We therefore recommend that the Zoological Survey be strengthened by the addition of scientific ichthyologists who would work in close touch with, and would occasionally be lent to, provincial departments. In this way they would soon accumulate a store of knowledge regarding the life-histories and habits of Indian fish, in the absence of which much of the work hitherto done has been, and must remain, ineffective.

CHAPTER IV.

Industrial Deficiencies of India.

Incompleteness of India's industrial equipment.

73. The sketch of Indian industrial conditions outlined in the preceding chapters would be misleading, unless we drew attention to the extraordinary extent to which the country, with its great industrial possibilities and requirements, is dependent upon outside sources of supply for the raw materials and manufactured articles necessary in the daily life of a modern civilised community. The existence of these deficiencies is prominently before industrialists and consumers alike at the present moment, and before presenting a list of them, we may briefly discuss their causes.

Causes of deficiencies.

74. The basis of modern organised industries in those countries where they made their first appearance, was the manufacture of cast and wrought iron. The invention of the steam engine created the necessity for machine tools, to produce parts which would fit with sufficient accuracy to give smooth and efficient working. The existence of machine tools greatly facilitated the manufacture of standardised parts in large quantities, which were in demand for the mechanical processes required in textile and other similar industries. These large-scale manufactures increased the demand for industrial chemicals.

But the course of industrial development in India has followed very different lines. The political and economic conditions of India in the past have created a large export and import trade; and this trade has brought about the present industrial position. A large railway system and such other mechanical facilities as were necessary for the preparation and transport of produce for export have been brought into existence, but, in the absence of an existing iron and steel industry, with imported appliances. The great textile industries similarly rely almost entirely on imported plant and spares. The obvious need of having repairs done on the spot has led to the establishment of numerous engineering shops, without any corresponding equipment for actual manufacture.

The Indian iron and steel industry.

75. An examination of the present position of the Indian iron and steel industry will show how the deficiency in this all-important industrial factor has affected the general situation.

Pig iron has been continuously produced in India since 1875, but it was only in 1914 that the steel industry was established on a firm basis;

and since the outbreak of war, the capacity of the plant has been strained to the utmost to meet urgent military demands. There has, therefore, been no opportunity as yet to gauge the results which must inevitably follow this important industrial advance, made at an extraordinarily opportune moment for India.

The imports of iron and steel in 1913-14, including galvanised iron, tin plates, steel sheets and plates, constructional iron work and railway plant, amounted to over 1,250,000 tons valued at 25 crores of rupees. In addition to these, there were large imports of manufactured iron and steel in the form of machinery and millwork, motor cars and under other heads. The total capacity of the two large Indian iron works is only a fraction of the total amount imported, and only simple forms of steel, such as rails and other rolled sections, are produced. The war has given a stimulus to extension, and the schemes now under consideration will undoubtedly result in an early increase in the volume of outturn and in a wider range of marketable products.

Imports of machinery.

76. The following brief statement of certain types of machinery imported by sea in 1913-14, the last year of peace conditions, will further illustrate the position :—

Articles.	Value.
	Rs.
Prime-movers	83,03,895
Electrical machinery	51,79,440
Agricultural machinery	2,65,335
Boilers	35,54,205
Metal-working machines	1,45,965
Oil-crushing and refining plant	3,21,870
Paper-mill plant	3,48,975
Rice and flour mills	15,99,180
Sewing machines and spares	40,70,055
Sugar machinery	4,67,325
Tea machinery	21,33,570
Textile machinery—	
Cotton	1,78,75,425
Jute	1,45,70,235
Others	3,53,820
Typewriters and spares	11,32,995
Miscellaneous items	1,33,11,180

The imports of boilers and prime-movers are due to the absence in India of a complete system of engineering industries, based on the large-scale manufacture of iron and steel. The lack of familiarity with the use of machinery among the people generally accounts for the fact that, though India's greatest industry is agriculture, the demand for agricultural machinery is limited to the products of a few small local manufactures, supplemented by imports valued at about Rs. 2½ lakhs. India produces

more than 3,000,000 tons of raw sugar per year, and in addition imports manufactured sugar to the value of Rs. 15 crores, yet the value of the sugar machinery imported was only a little over Rs. 4½ lakhs. Similarly, oil seeds worth nearly Rs. 25 crores were exported; but oil-crushing and refining plant to the value of only Rs. 3 lakhs was imported. With paper and pasteboard imports worth Rs. 160 lakhs, paper-mill machinery and plant worth only Rs. 3½ lakhs were imported. These figures are significant of the exiguity of the efforts hitherto made in India to replace imported articles by the manufacture of indigenous raw materials. On the other hand, the very large value of the imports of machinery for the textile industry is due to the entire absence in India of any engineering works capable of supplying her needs, and the consequent reliance on overseas sources for this all-essential need of our largest existing industry. The direction of Indian industrial development has been thus predetermined by the existence of a large export trade in raw materials, and by the ease with which most classes of manufactured articles could be imported from abroad. Other factors arising to some extent out of this general tendency, have helped to restrict Indian industrial progress in the past to an incomplete and limited development along the lines already indicated.

Shyness of capital for modern enterprises generally.

77. Where money has been invested in industries, it has generally been confined to a few simple and safe enterprises of an obviously attractive nature, whilst equally important minor industries have been almost entirely neglected, partly through ignorance of the country's resources in raw materials, but mainly because commercial firms have prospered too well along conservative and stereotyped lines to trouble about undeveloped industries with uncertain prospects. Before the war, they could always be sure of importing all necessary stores and machinery of assured and regular quality, and they have naturally preferred a safe profit from trade, or from such established industries as jute and cotton manufacture, to a doubtful return from such ventures as metallurgical and chemical manufactures. Another contributory cause has been the practice pursued by Government departments of indenting on the India Office for miscellaneous stores, which has been to some extent due to the absence of a stores-purchasing department in India. Government rules intended to encourage the purchase of locally manufactured articles have not succeeded in counteracting the tendency of indenting officers to place on some recognised authority the responsibility for price and quality.

Generally speaking, the industries based on technical science have been disregarded, because profits in other ways have been easy and assured. The neglect of applied science is perhaps the most conspicuous among our administrative deficiencies.

Deficiencies in industrial system.

78. We have dealt in greater detail in Chapter X with the corresponding dependence of India on imported technologists and engineers. It was to this aspect of the question, as well as to the economic

loss caused by importing articles which could be manufactured in India and to the absence of Indian capital and management in many existing industries, that the attention of those who urged the need for industrial advance was principally directed before the war. The incompleteness of our existing system of industries has been subsequently brought into prominent notice by the interference with industrial supplies from overseas due to the war. This constitutes a serious national danger, the extent and gravity of which will be the more clearly realised, if we refer in detail to some of the more important manufactured *materials* or *articles* which are not at present made in India, although the basis for their production exists in the form of raw material.

Deficiencies in manufactured materials. (a) Metals.

79. We have already referred to the position of the iron and steel industry. In the case of the non-ferrous metals, the Bawdwin mine, situated in the Northern Shan States of Burma, contains sufficient lead and zinc to meet in full the demands of India for these metals; but as yet only metallic lead is smelted, and, before the war, a small proportion of the zinc ores was exported to Germany and Belgium, and afterwards to Japan. These ores are not only valuable for their metallic contents, but are capable of yielding large quantities of sulphur; and the establishment of zinc-smelting works, with recovery of the sulphur in the form of sulphuric acid, is a step which is absolutely necessary in the interests of existing and future chemical industries, and is likely to be undertaken within the next two or three years. At present, India does not actually produce refined copper, although the Cape Copper Company has already begun smelting for blister and will shortly place refined copper on the market. The plant of this company has a capacity of 1,000 tons of refined copper per annum, which is, however, equivalent to a small fraction only of the imports. These, in the form of brass, yellow metal, copper sheets, copper wire and miscellaneous manufactures, amounted yearly to over 37,000 tons, valued at Rs. 411 lakhs. In addition, nearly 1,300 tons of German silver, an alloy of copper and nickel, were imported worth over Rs. 22 lakhs.

India is apparently well supplied with bauxite as a source for aluminium; but until hydro-electric energy is procurable at a cost low enough to permit of smelting under economical conditions, the metal cannot be produced in this country. We believe that one or other of the hydro-electric schemes projected on the Western Ghats will be able to supply electricity at a sufficiently cheap rate, and it is desirable that Government should facilitate the institution of suitable schemes.

Until 1914, the manufacture of tungsten powder was practically confined to Germany, though, since the outbreak of war, it has been carried on in the United Kingdom. Unless tungsten is smelted in India, we shall be unable to produce ferro-tungsten and "high-speed" steel, which are almost essential requirements in modern engineering shops. They are made by highly specialised manufacturing processes, which can be successfully introduced into India only with the help of some

existing company already engaged in the industry and in full work. No use is at present made of Indian chromite in the country for metallurgical, and very little for chemical, purposes. Ferro-manganese has recently been produced in India, but for other ferro-alloys required in the manufacture of special steels, we are dependent upon imported supplies. Most of these can be produced only, or at any rate most suitably, in an electric furnace, which can be worked economically on a relatively small scale. The immediate want, as in the case of ferro-tungsten and aluminium, is a supply of cheap electric power. Indian graphite, in most occurrences, is impure, but Ceylon graphite can easily be imported. We do not, however, manufacture graphite crucibles, a necessity in various metallurgical and other industries. India is the principal source of mica of the highest grades, but, in the absence of any manufacture of electrical machinery, it has to be exported at present in a practically raw state. We have in the Travancore monazite a large supply of incandescent earths suitable for the manufacture of gas mantles, but owing to our inability to manufacture thorium nitrate in this country, the mineral is exported in the form of concentrates.

(b) Chemicals.

India imports chemicals to the value of more than a crore of rupees a year; but owing to the great variety and the relatively small quantities of each kind consumed in India under peace conditions, local manufacturers have hitherto limited their attention to the few "heavy" chemicals which were in sufficient demand to support an economic unit of manufacture, and, as in the case of acids, were protected by heavy sea freights. Simple drugs and extracts are also manufactured on a small scale, but only in official medical stores and a few private factories on any recognised standard of purity and strength. Though improvement has been effected under war conditions, much still remains to be done before we exhaust the possibilities of these important products in this direction. We have already referred to the dependence of India on outside sources for sulphur, and to the necessity of insisting on the local smelting of her sulphide ores. In the absence of any means for producing from purely Indian sources sulphuric, nitric and hydrochloric acids, and alkalis, our manufactures, actual or prospective, of paper, drugs, matches, oils, explosives, disinfectants, dyes and textiles are dependent upon imports which, under war conditions, might be cut off. Sources of raw materials for "heavy" chemicals are not deficient. The output of saltpetre could be raised to 40,000 tons per annum, and supplementary supplies of nitrates could be produced, if necessary, from atmospheric nitrogen; but for this again, cheap electric power is needed. Salt occurs in abundance and the establishment of caustic soda manufacture, preferably by an electric process that would also yield chlorine, is a necessary part of our chemical programme. There are available in the country, in fair quantity, many other raw materials necessary for "heavy" chemical manufacture, in addition to those referred to under other heads; among them may be mentioned alum salts, barytes, borax, gypsum, limestone, magnesite, phosphate of lime and ochres. The installation of plant

for the recovery of by-products in coking has recently been undertaken but for the recovery of tar and ammonia only. The recovery of benzol and related products has so far not been attempted, nor has anything been done to utilise the tar by re-distillation or other chemical treatment.

(c) Vegetable and animal products.

Although India exported raw rubber valued in 1917-18 at 162 lakhs, rubber manufacture has not been started in the country, and goods to the value of 116 lakhs were imported in 1917-18. This industry is one of those that are essential in the national interest and should be inaugurated, if necessary, by special measures. Though textile industries exist on a large scale, the range of goods produced is still narrow, and we are dependent upon foreign sources for nearly all our miscellaneous textile requirements. In addition to these, the ordinary demands of Indian consumers necessitate the import of some Rs. 66 crores worth of cotton piece-goods, and interference with this source of supply has caused serious hardship. Flax is not yet grown in appreciable quantities, and the indigenous species of so-called hemp, though abundantly grown, are not at present utilised in any organised Indian industry. Our ability to preserve many of our foodstuffs in transportable forms, or to provide receptacles for mineral or vegetable oils, depends on a supply of tin plates, which India at present imports in the absence of local manufactures. Our few paper factories before the war stood on an uncertain basis, and we are still dependent upon foreign countries for most of the higher qualities. India produces enormous quantities of hides and manufactures certain qualities of leather on a relatively small scale by modern processes and the village tanner supplies local needs only, and with a very inferior material. To obtain the quantities and standards of finished leather which the country requires, it will be necessary to stimulate the industry by the institution of technical training and by experimental work on a considerable scale. This subject is treated at some length in Appendix D. Large quantities of vegetable products are exported for the manufacture of drugs, dyes, and essential oils, which, in many cases, are re-imported into India. Some efforts have recently been made to lessen this obvious waste, but, in the absence of a sufficient botanical and chemical staff, it has hitherto proved impossible to open up the very important and profitable field of industry which indubitably awaits development in this direction.

Other deficiencies.

80. India's defective industrial equipment is further exemplified by imports of cement valued at Rs. 66 lakhs, soap at Rs. 75 lakhs, and paints at Rs. 64 lakhs. The manufacture of these materials has for long been established in the country, and has been appreciably increased since the year 1913-14, but the extent by which it falls short of the requirements of the country is fully evident.

Deficiencies in the production of articles.

81. So far we have considered only the case of manufactured *materials*, but these are in many cases of little use, unless they can be converted into *articles* of industrial or domestic value, and Indian manufacturers

have in the past confined themselves to a very small number of these, which seemed to promise certain and large profits. The blanks in our industrial catalogue are of a kind most surprising to one familiar only with European conditions. We have already alluded generally to the basic deficiencies in our iron and steel industries, and have explained how, as a result of these, the many excellent engineering shops in India are mainly devoted to repair work, or to the manufacture, hitherto mainly from imported materials, of comparatively simple structures, such as roofs and bridges, wagons and tanks. India can build a small marine engine and turn out a locomotive, provided certain essential parts are obtained from abroad, but she has not a machine to make nails or screws, nor can she manufacture some of the essential parts of electrical machinery. Electrical plant and equipment are still, therefore, all imported, in spite of the fact that incandescent lamps are used by the million and electric fans by tens of thousands. India relies on foreign supplies for steel springs and iron chains, and for wire ropes, a vital necessity of her mining industry. We have already pointed out the absence of any manufacture of textile machinery, and with a few exceptions, even of textile-mill accessories. The same may be said of the equipment of nearly all industrial concerns. The list of deficiencies includes all kinds of machine tools, steam engines, boilers, oil and gas engines, hydraulic presses and heavy cranes. Simple lathes, small sugar mills, small pumps, and a variety of odds and ends are made in some shops, but the basis of their manufacture and the limited scale of production do not enable them to compete with imported goods of similar character to the extent of excluding the latter. Agriculturists' and planters' tools, such as ploughs, *mamooties*, spades, shovels and pickaxes are mainly imported, as well as the hand tools of improved character used in most cottage industries, including wood-working tools, healds and reeds, shuttles and pickers. Bicycles, motor cycles and motor cars cannot at present be made in India, though the imports under these heads were valued at Rs. 187 lakhs in 1913-14. The manufacture of common glass is carried on in various localities, and some works have turned out ordinary domestic utensils and bottles of fair quality, but no attempt has been made to produce plate or sheet glass, or indeed any of the harder kinds of commercial glass, while optical glass manufacture has never even been mooted. The extent of our dependence on imported glass is evidenced by the fact that in 1913-14 this was valued at Rs. 164 lakhs. Porcelain insulators, good enough for low tension currents, are manufactured, but India does not produce the higher qualities of either porcelain or china. Attention has been directed to the building of steel ships, but until the local supply of steel has been greatly increased, it is more than doubtful if expectations in this direction can be realised, and it is probable that there are other ways in which our present relatively small supplies of Indian steel can be more quickly and more profitably utilised.

Dangers of deficiencies.

82. The list of industries which, though their products are essential alike in peace and war, are lacking in this country, is lengthy and almost ominous. Until

they are brought into existence on an adequate scale, Indian capitalists will, in times of peace, be deprived of a number of profitable enterprises whilst in the event of a war which renders sea transport impossible, India's all-important existing industries will be exposed to the risk of stoppage, her consumers to great hardship, and her armed forces to the gravest possible danger.

Suggested remedies.

83. The removal of these deficiencies is one of the main objects of our proposals, and the various schemes which we set forth are designed to meet this end, as well as to promote the industrial prosperity of the country generally. We desire, however, to draw attention here to the necessity of securing the inception in India of certain very specialised and essential industries which must be set up in this country at the earliest possible date, if grave dangers are to be avoided. Though in many cases the importation of technical specialists will be sufficient to enable our local industrial capitalists to get to work, there are a few classes of articles produced only by firms which have attained efficiency in their manufacture after the experience of many years and the expenditure of much money. The machinery and apparatus which they employ is often manufactured only by themselves or to their own specifications, and its imitation in this country is not possible, nor, were it possible, would this be sufficient. Therefore, to attain its end, Government must take special steps to facilitate the manufacture of these articles in India. Among such industries we would include the production of such essential articles as magnetos, incandescent lamps, ferro-tungsten, "high-speed" steel, graphite crucible special forms of porcelain for insulators, chemical glass, and probably also certain forms of "heavy" chemicals, rubber and vulcanite. In other countries, foreign firms have frequently been encouraged to start branches by the existence of high tariff walls; there are also somewhat numerous examples of direct encouragement accorded to the establishment of foreign firms manufacturing lethal munitions; and we believe that there are several cases in which outside manufacturers have been helped to set on foot the production of articles needed in the interests of national safety, such as motor tyres and locomotiyes. There are many other important manufactures, which, though they must be carried out on a large scale, involve no secret processes that any well-trained specialist should be unable to initiate; and in the inception and stimulation of this large range of important industries, the organisation which we propose and the efforts of private industrialists will be more than fully occupied for a long time to come.

CHAPTER V.

Industries and Agriculture.

Importance of agricultural improvements.

84. It will be clear from the general trend of this report that the present position and future prospects of Indian industries depend to a very large extent on the products of Indian agriculture. We take this opportunity of stating in the most emphatic manner our opinion of the paramount importance of agriculture to this country, and of the necessity of doing everything possible to improve its methods and increase its output. We consider the improvement of agriculture necessary, not only because it forms the basis on which almost all Indian industries must depend, but also for the further reason that the extension among the people of a knowledge of improved agricultural methods, and, in particular, of the use of power or hand-driven machinery, will benefit agriculturists both by adding to their income and by its educative effect.

Such improvements will, we anticipate, be mainly effected by organisations which are in process of development under the charge of the imperial and provincial Departments of Agriculture, and though the results attained are not yet of much economic importance, they are steadily growing, and will eventually demand large manufacturing establishments to produce the machinery, plant and tools which the ryot will find advantageous as labour-saving devices.

Agricultural progress will inevitably be followed by a general rise in the standard of living, which will create a much larger demand for manufactures than now exists, and thus provide within the country a market for the products of the increased industrial activity which our proposals are designed to ensure.

It is obvious, therefore, that the efforts of Government for the improvement of agriculture should be made *pari passu* with those which it may adopt for the improvement of industries, as the result of the recommendations in this report.

Possibilities of improved agricultural methods.

85. We have drawn attention in Chapter III to the large proportion of Indian products which are exported in an unmanufactured condition. The improvement of agriculture will no doubt increase the volume of such products raised in India ; but it is far from likely that the result of this will be a proportionately greater export of raw produce. The increase of capital, the rise in wages, and the economic education of agriculturists, which will result from agricultural improvement, are all

factors which are likely to assist industrial development. To take one example, sugar is an important item of the food supply of the people of India, and one reason why such a large quantity is at present imported, is the want of adequate means for familiarising Indian farmers with the principles of scientific agriculture and for putting them in a financial position to take advantage of these. It is scarcely conceivable that a similar state of affairs should arise with regard to any other food product of equal or greater importance; but the instance of sugar is, at any rate, significant of a state of affairs into which a country, which neglects agricultural improvement, may easily drift.

The Indian Famine Commission, 1880, pointed out that "the numbers who have no other employment than agriculture are in large parts of the country greatly in excess of those required for the thorough cultivation of the land." In the forty years which have elapsed since this was written, there has been some change for the better, but it is still strictly true that there is a vast field for improvement in the efficiency of the methods and, still more, of the implements employed by the ryots. It is well known that, in many cases the yield per acre of Indian crops is very much lower than that obtained in other countries. The average weight of stripped cane per acre in the principal sugar-producing tracts of India is only ten tons against forty tons in Java. In India 98 pounds of ginned cotton are obtained per acre; in the United States nearly 200 pounds; and in Egypt 450 pounds. The average yield of rice per acre is only about half what it is in Japan. India cannot, however, claim to set off against the lower yield a greater economy in the use of her available labour.

Scope for machinery in Indian agriculture.

86. In British India, the area under cultivation is approximately 250,000,000 acres, of which 40,000,000 acres are, for the time being, fallow and unworked. The Census Returns of 1911 show that of the total population, 80,000,000 are directly employed on the land, or one person to every 2·6* acres of cultivated land. Previously to the outbreak of war, the corresponding figures for Great Britain and Germany were one to 17·3 and one to 5·4 acres, respectively. The only crops grown in both England and India on a large scale are wheat and barley; the respective standards of yield are 1,919 lbs. and 814 lbs. per acre for wheat, and 1,645 lbs. and 877 lbs. per acre for barley. It becomes, therefore, regrettably clear that agricultural operations are conducted with much greater efficiency and economy of human labour in both Great Britain and Germany than they are in India. This is partly due to the superior physique and education of the cultivators them-

* Fallows have been excluded in the case of India and included in the case of Great Britain and Germany. In India, fallows are due, as a rule, to accidental misfortune, or to land being on the very margin of cultivation. Fallow land in India is entirely neglected; in England and Germany it is kept clean and well cultivated as a regular feature of agricultural practice. Meadows and grass lands have been included in all three cases, though they are carefully treated in England and Germany, and receive little or no attention in India.

selves, partly also to the superior quality of their cattle, but it very largely results from the extensive employment of horse and motor-driven machinery in the varied operations of a modern farm, such as ploughing, reaping and threshing. The census of production of 1908 revealed the fact that the farmers of Great Britain in that year employed nearly 35,000 engines, developing well over 200,000 horse power, and it cannot be doubted that since that date the use of small motors and power-driven tractors has greatly increased, as agricultural engineers both in Europe and America have devoted much time and labour to devising improved machinery of this class. In India, agricultural conditions are widely different; but there is an equal, if not greater, scope for mechanically operated plant. As yet, very little is in use, chiefly because holdings are small and scattered, and ryots possess little or no capital. The co-operative movement may be expected to promote combinations to secure some of the advantages of farming on a large scale, and these would be greatly stimulated by the grant of *takavi* loans for the purchase of labour-saving machinery. Attention will be drawn to the results achieved in this direction in the south of India—not very important perhaps, if measured by their immediate economic effect, but of great value as indicating the line along which development may be pursued with certain prospects of success.

87. Power-driven machinery may be very largely employed in India in connection with agriculture :—

(1) to lift water for irrigation from wells, channels, tanks, water-courses and rivers;

(2) to improve the land by draining low-lying ground and water-logged soil and keeping down the level of saturation in canal-irrigated tracts; and in certain parts of the country, by deep ploughing;

(3) to prepare crops for the market in the most profitable form. This includes such operations as fibre and oil extraction, wheat grinding, paddy husking, coffee pulping, tea manufacture, and, most important of all, sugarcane crushing, a subject which will be dealt with in more detail below;

(4) to prepare materials required in agriculture, such as bone meal for manure, and crushed or chopped cattle food.

Scarcely less important, both as an educative influence on the cultivator and as a means of improving the efficiency of agricultural labour and the quality of the produce, is the provision of hand machinery of improved types, especially for the reaping, threshing and winnowing of crops, and the preparation of food and fodder; also of modern plant and implements worked by animal power, to cultivate the land or drive small machines. Further, these will also serve as an easy introduction to the use of power-driven machinery proper.

Irrigation by mechanical methods.

88. We cannot do more than indicate very roughly the extent to which the development of irrigation by mechanical methods may ultimately be carried, and the following observations are only intended to

convey some notion of what is possible. There are at least three million wells in India from which water is lifted for irrigation, and the number of men and cattle employed on this work is very large. The Indian Irrigation Commission of 1901-03 reported that the area under wells was not less than 16 million acres; and they remarked :—"It may not be sanguine to look forward to a period when the area under well irrigation throughout India will have been doubled." Since this opinion was expressed, mechanical methods of lifting water from wells and rivers have been greatly developed, and the depth from which water can now be profitably raised is at least twice what it was 15 years ago. This enormously increases the volume of underground water which can be tapped, and consequently the area which might be brought under irrigation. Within the last few years, fully 1,000 pumping stations have been established in the south of India, and the number is large enough to warrant the general conclusion that mechanical methods of lifting water for irrigation can be applied in India on a very extended scale. Even if in no more than five per cent. of the wells now used for irrigation the use of small mechanically driven pumps were practicable and the area under well irrigation developed to the extent the Irrigation Commission anticipated, this would mean the employment of about 300,000 pumping sets at an initial capital outlay of something like 50 crores of rupees, with annual working expenses of probably not less than six crores, and with the result of very large gains to the cutivatlors. The manufacture of this immense amount of plant, with adequate provision for renewals and repairs, should give employment to many large mechanical engineering establishments, which would undoubtedly grow up to supply so vast a market. Steam, oil, gas, and petrol engines, and electric installations could all be appropriately used as sources of motive power, each on more or less standard lines which would greatly facilitate their manufacture. Similarly, a great variety of pumps would be required, and for each there would be a large demand. Where conditions are favourable, central generating stations might be established and the motive power for driving the pumps distributed electrically, while incidentally the demand for belting would keep several large factories fully occupied.

Attention may also be drawn to the advantages of pumping water from rivers for irrigation. Both in Madras and Bombay, some work in this direction has already been done, and the Divi island plant on the Kistna river is probably the largest irrigation pumping station in the world. The total cost of this installation was 20 lakhs of rupees, and it now irrigates an area of 35,000 acres. There are many rivers, the perennial flow of which is by no means fully utilised, but could be made available, if lifted from the river beds by means of pumps. The possibilities of lift irrigation in Sind are unknown, but probably very great. The river Indus flows through the country and, by means of inundation canals, irrigates considerable areas during the flood season; but for the rest of the year the water flows uselessly into the sea. The project for the construction of a barrage across the Indus is still under

consideration, and, if it be finally accepted as practicable, the work will be difficult and protracted. It seems that investigations should be made to ascertain the feasibility of irrigating the land by pumps in the meantime. Experimental work can be done at a very small cost and can be developed with great rapidity if successful. The possibility of growing Egyptian cotton in Sind can be thoroughly tested by a preliminary irrigation scheme of this type, and, if the results are promising, progress can be made with demonstration work in readiness for the barrage irrigation system.

Increased yields to be obtained from sugarcane cultivation.

89. In our note on sugarcane (Appendix C), we have drawn attention to the results likely to be obtained by the introduction of central power-driven cane-crushing plants. Each of these at pre-war prices cost about Rs. 12,000, and is capable of dealing with 100 acres of good cane in a season. Roughly, of the sugar consumed in India, three-fourths is grown in the country and one-fourth is imported. Roughly also, of that grown in the country, one-third is wasted owing to the inefficiency of the primitive methods of extraction. Nearly one-half of this loss might easily be avoided, and, if it were, the profits of cane cultivation would be greatly increased.

We have had much evidence brought before us to show that, under favourable conditions, sugarcane cultivation is very profitable and yields much higher returns than can be obtained from most other crops; but the average outturn throughout the country is exceedingly poor, and the area under cane cultivation depends upon, and varies with, the relation between the prices obtainable for sugar or *gur*, and those for such crops as paddy and *ragi*. The ryot's difficulties are want of water for irrigation, the strain imposed upon his cattle during the cane-crushing season and lack of capital. The pump will often help him over his first difficulty, and the engine will drive his mill and reduce the work thrown on the cattle to that of carrying the cane from the field to the mill, while the larger yield and the smaller expense in working will greatly increase his profits.

Years ago, the iron-roller mill replaced the wooden *charki*, and now the time has come when the power-driven mill should as completely replace that worked by cattle. The area under cane cultivation in British India is about 2½ million acres. Improvements in the methods of extracting the juice can certainly increase the yield by ten per cent., and it is equally certain that better cultivation and the more extended use of manure should add at least 20 per cent. to the gross weight of the crop, making the total increase in the amount of sugar produced in India 32 per cent., or more than sufficient to render the country self-supporting at the present time. The universal adoption of power plants for cane crushing would cost about 30 crores of rupees; this expenditure would be justified by the consequent reduction of the present cost of cane crushing and by the increased yield of sugar. The indirect gains to agriculture would also be of the highest importance.

Large numbers of cattle, whose work must be equivalent to many hundreds of thousands, probably millions, of horse power, are employed in lifting water and crushing cane. It is hardly realised how heavy is the burden thus entailed upon the farmer's cattle, and how severe the resulting deterioration of their working power for purposes of cultivation.

It will, therefore, be seen that, even under the present conditions of Indian agriculture, an expenditure of 80 crores of rupees upon machinery for well irrigation and cane crushing alone would be highly remunerative, and it is probable that thereafter a further, and possibly greater, outlay would prove profitable. Rough figures only have been given to convey some idea of the scale on which operations might ultimately be conducted, but they suffice to show that in this direction alone a vast mechanical engineering industry and many others subsidiary to it would inevitably spring up throughout the country.

Improvements in oil extraction.

90. Oil seeds are grown on an average area of about 15 million acres in British India; a large proportion of the crop, valued at about 36 crores of rupees, is exported in normal years and the remainder consumed locally. The extraction of oil is practised to some extent wherever oil seeds are grown, chiefly by means of bullock-driven *ghanis*, which are neither efficient in expression nor economical in labour. Power-driven mills are found to some extent in Calcutta, Bombay and elsewhere, particularly on the west coast for the treatment of copra; but there is room for great extension of their use, especially for types of plant which will give a more complete extraction. This is perhaps of less importance in the case of oil seeds which yield cake for cattle food; but when the cake is used for manure, as in the case of castor seed, any oil left in it is wasted. Indeed it is probable that even in cake used for cattle food any excess of oil over five per cent. is wasted, and that, in all cases where edible cake is directly used as manure, any oil contents whatsoever are not merely valueless, but actually harmful. In recent years, the extraction of oil by continuously operated screw-presses has become more common; this process has proved very satisfactory in treating certain kinds of Indian seeds, and there is undoubtedly a large field for its employment. As in the case of sugarcane crushing, and for the same reason, it is desirable to eliminate cattle-driven mills and to employ more powerful and, therefore, more efficient means of extraction. At present, so large a percentage of the oil available from the seeds is left in the cake that there seems to be a fair prospect of successfully working the latter over again by solvent processes, which are capable of extracting the oil almost completely. This would be a great gain in the case of fertiliser cakes. But, as regards fodder cakes, the Indian ryot is not yet convinced that his cattle can only usefully assimilate a small proportion of the oil contained in the cake which he feeds to them, and, therefore, he still prefers to feed his cattle on cotton seed rather than on cotton-seed oil cake.

91. Even from the point of view of Indian industrial development, the necessity for increased efforts for the improvement of agriculture is clear. The ideal before the Department of Agriculture is the production of a larger output of more valuable crops, with smaller demands on human and animal labour. This will result in a greater creation of wealth and an increase in the raw materials for industries; will ease the difficult problem of the supply of cattle; and will liberate additional labour for industries.

Effects of agricultural improvements on industries.

92. We may again emphasise the imperative importance of keeping the Department of Agriculture in close touch with modern developments connected with the generation of power. India is not yet at all accustomed to a free use of mechanical appliances, and it should be an important function of the Departments of Industries and Agriculture to encourage their introduction in every possible way. Experience in other countries is not directly applicable to India, and a special study of the local conditions is essential to rapid and sustained progress. The Director of Industries in each province should have a complete laboratory, equipped for the mechanical testing of small prime-movers and the machinery that they are intended to drive. The requirements of the ryots should be studied, and any defects in the machinery should be carefully noted and communicated to the makers. For a long time to come, the employment of machinery in agricultural India will largely depend upon the completeness and efficiency of the official organisation which is created to encourage its use and to assist those who use it.

Co-operation between Departments of Agriculture and Industries.

CHAPTER VI.

Power.

93. The distribution of the natural resources for generating energy which a country possesses, mainly determines the location of, at any rate, those industries in which the cost of fuel for power and heat bulks largely in the total manufacturing charges.

Position of India in respect of power supplies.

In the mill and general engineering industries, fuel is chiefly required to generate power, and, though its cost is important, it is seldom the dominant factor. With sea transport available to coast towns, with the extended railway system which the country now possesses and with other sources of fuel supply yet to be mentioned, no great difficulty appears to be experienced in any part of India in obtaining coal or some form of fuel, at what may be deemed a reasonable cost for ordinary power purposes. It may here be observed that the greatly increased efficiency of our methods of converting heat into work during the last 20 years has materially improved the position of India as a potential user of mechanical appliances, though the effect is not yet fully apparent, owing to natural reluctance to relegate to the scrap-heap obsolete but serviceable plant. Engines are in use which, though they are still mechanically in good condition, require much more steam than a modern engine of the same size. The institution, however, of certain important industries, for example electro-smelting and some electrolytic chemical processes, is possible only when power is available at rates well below the cost at which it can usually be obtained through the medium of heat engines.

Sources of Power Supplies

94. As we have already seen, the distribution of coal in India is very irregular, being chiefly confined to the old province of Bengal, where the deposits are of great extent; to the Central Provinces and Central India, where the fields are only partially developed, and, so far as is known, contain only coal of an inferior description; and to the Hyderabad State, which possesses the Singareni field yielding a steam coal of fair quality.

Coal.

For metallurgical purposes the supplies of suitable coal are greatly restricted. The Tertiary coal of north-east Assam produces an excellent coke, but its situation naturally limits its use; there are also similar coals in some of the smaller Assam fields, like Daranggiri, which are

not yet served by railways; but the only large supply of good coking coal so far established, and within an area suitable for industrial development on modern lines, is that of the Gondwana fields of Bengal and Bihar.

Even in these Gondwana coking coals, the high perçentage of ash and correspondingly low calorific value reduce their radius of economic use under conditions of railway transport, and it will be still further diminished, as the shallow seams are exhausted and the deeper coal is worked at higher cost. The demands for coal from the Bengal fields are rapidly growing, and the metallurgical developments that are economically desirable or are necessary on the ground of military security, will increase the demand for the best qualities of coal to an extent that necessitates a special survey of the situation, with a view to introducing economies in the methods of mining and consumption. We recommend that this question be taken up at an early date. Such a review of the fuel situation in eastern India should include an examination of measures in progress for rendering more accessible the undeveloped fields of Assam.

The coals of the Central Provinces are generally characterised by high percentages of ash and moisture with correspondingly low calorific values. As sources of power, therefore, these coals have a limited sphere of utility, and being, so far as is known, unsuitable for coke making, their use is limited to steam raising.

Coal of Tertiary age, generally inferior in quality and limited in quantity, is obtained from small fields at Palana in the Bikanir State in the Salt Range of the Punjab, in Jammu and in Baluchistan. These sources of supply are insufficient to meet the demands of industries conducted on anything approaching modern lines.

Wood fuel.

95. The forests are capable of yielding important supplies of wood fuel, which can be most advantageously employed, after conversion into gas, to generate power in internal combustion engines. Gas plants are obtainable which can be worked with the wood either in its natural state or after its reduction to charcoal. But we may observe, in passing, that the use of wood in steam boilers, when the steam is required for power purposes, is extremely wasteful and should be discouraged as much as possible. The forests of India are unfortunately confined chiefly to the hilly tracts, and over large areas the cost of transport of wood fuel is so heavy as almost to preclude its use. Further, the evidence we have gathered, chiefly from the officers of the Forest Department, does not encourage the idea that, even in the neighbourhood of the forests, the supply of fuel is capable of any very great expansion. Little or no information could be obtained regarding the rate of reproduction of fuel trees in natural forests, and the opinion was generally expressed that it would be necessary to have recourse to extensive planting to meet any heavy and continuous demands for wood fuel at reasonable rates. Only at Changamanga in the Punjab and in the south of India,

chiefly in the neighbourhoods of Madras and Bangalore, have fuel plantations been at all extensively made. The results obtained from casuarina plantations along the Coromandel Coast have been very satisfactory, also those from the comparatively small areas on the Nilgiri Hills planted with eucalyptus.

We consider that the economic aspects of forestry in relation to the fuel supply of the country have hitherto not received sufficient attention. We desire to direct attention to the advantages of wood distillation as a method of obtaining charcoal and certain valuable by-products, acetate of line, methyl alcohol and wood tar, by the sale of which the local cost of the charcoal would be greatly reduced. For all but the smallest units of power a suction gas plant is extremely convenient and efficient, and we recommend that any methods which are likely to cheapen the cost of fuel for such plants should be the subject of detailed investigation and trial.

Oil and alcohol.

96. There is no possibility of estimating the prospects of oil production, and it would therefore be unwise to rely on this form of fuel to make up for the depletion of our coal supplies. The serious economic value of the oil-bearing areas in Baluchistan and the Punjab is still far from being established as a commercial proposition ; the oil field of north-east Assam has shown very slow expansion, and the value of the new fields at Badarpur in central Assam has yet to be demonstrated. In Burma, the three main fields of Yenangyaung, Yenangyat and Singu are being rapidly exploited, and no others likely to replace them have so far been proved, in spite of extensive and costly prospecting operations.

It is very undesirable that the fuel supply of the country should be derived from external sources, and we were informed that in the Madras Presidency and Mysore, this aspect of the question had been considered by the Departments of Industries, whose officers now recommend the use of suction gas plants for all units of over ten horse power when charcoal can be obtained at a reasonable rate, and endeavour to confine the employment of the oil engine to power units below this size. Petrol is chiefly used in motor cars and small engines which are only intermittently employed. As a source of industrial power, it is unimportant ; but the demand for it for other purposes is likely to grow, and the provision of a suitable substitute is generally recognised as desirable, if not actually imperative. On several occasions our attention was drawn to the possibility of making industrial alcohol from hitherto neglected vegetable materials, some of which appear to be sufficiently promising to justify investigation and experiment. We recommend that a more liberal policy should be followed by the excise authorities in respect of the class of denaturant prescribed, and more regard might be paid to the likelihood rather than to the mere possibility of frauds upon the revenue, when the requirements of commercial users conflict with excise regulations.

97. The value of wind power in India is very small, owing to the lightness of the prevalent winds, except along the sea coast and on the Deccan uplands. For industrial use this source of power is too intermittent and too uncertain, and it can only be employed with advantage for lifting water, either for domestic purposes or for irrigation. In the first case an elevated tank, in the other a storage reservoir is necessary; and only where these can be cheaply installed is it worth while to set up a windmill. Such mills are not common now, but the increasing cost of labour and the growing tendency to resort to mechanical appliances will probably lead to a more extensive use of them in the future.

Wind power.

98. The principal reason why India has been able to develope water power only to a limited extent is that the seasonal character of the rainfall makes storage works in most cases a necessity, and the outlay involved in their construction, unless the water can be used for irrigation afterwards, is likely to raise the cost of power above the rate at which it can be generated by other means. The progress that has been made in the development of hydro-electric methods of generating and distributing electric energy has, however, opened out new prospects in India, which, in recent years, have been greatly enlarged by the investigations of engineers in the Bombay Presidency and the practical results which they have obtained. Before the electric transmission of power over long distances became a practical success, the use of water power in India was confined to one or two fairly large cotton mills, as at Gokak and Ambasamudram, to a number of small factories on planters' estates in the hills, and to numerous small water wheels on hill streams and at falls on the irrigation canals, which drive flour mills.

Water power.

The Mysore Durbar set up the first central hydro-electric installation in India on the Cauvery river at Sivasamudram in 1903. Beginning with 4,000 horse power, the central generating station has been gradually enlarged, till at the present time its capacity is about 18,000 horse power, the major portion of which is transmitted at 70,000 volts over a distance of 90 miles to the Kolar gold fields. The irregular flow of the Cauvery has been overcome by the construction of a dam across the river at Kannambadi near Seringapatam, which stores sufficient water to maintain a minimum flow of 900 cubic feet per second. The Kashmir Durbar subsequently established a hydro-electric station on the Jhelum river near Srinagar; but in this instance, the anticipated demand for power has as yet been only partly realised. In western India, attention was drawn to the potentialities existing in the heavy rainfall on the country fringing the Ghats and the facilities offered for the construction of hydro-electric installations by the very steep drop to the plains. After years spent in surveys and the preparation of plans, a company was formed with Indian capital, which has carried out a series of works in the neighbourhood of Lonavla, and these, though not yet complete, already supply the cotton mills in Bombay with 42,000 horse power for 12 hours a day. Additional works of a similar

character, but on an even larger scale, are now being constructed in the Andhra valley, and are under contemplation in both the Nila Mula and Koyna valleys, though progress is greatly delayed by the war. The electric energy now supplied to Bombay is roughly equivalent to that which would be obtained from 600 tons of coal a day, and the reduction of the Bombay demand by this quantity is, under war conditions, a matter of great importance. It is expected that about half a million horse power will be obtained from the Western Ghats, which can either be transmitted to Bombay or utilised on the coast for electro-chemical industries, such as the extraction of aluminium from bauxite and the manufacture of nitrogen compounds from the air.

Elsewhere in India comparatively little use has been made of water power, though numerous cities and towns have been equipped with stream-driven electric installations for the supply of light and power. Undoubtedly the most important sources of water power immediately available are to be found in the streams and rivers draining the Himalayas; but, except for the electric lighting of hill stations like Simla and Darjeeling, no profitable application of it has yet been discovered. The main Indian centres of population and industry, except Bombay, are situated at great distances from those parts of the country where the natural features exhibit possibilities for the generation of water power.

Necessity for hydrographic surveys.

99. The preliminary reconnaissances which have been made have yielded very little reliable information as to what can be done in the future. We now require hydrographic surveys on a much more elaborate scale than has hitherto been attempted. In view of the increased possibilities of water power due to the recent advances in electro-chemical and electro-metallurgical technology, these are now likely to produce results of practical importance. Large amounts of water power are in commercial use in other parts of the world for the manufacture of iron, steel, alloys, aluminium, calcium carbide and various nitrogen compounds. As we have elsewhere pointed out, it is imperative that some, if not all, of these industries should be established in India, and in order that they may be successfully worked on a commercial basis, the operations will have to be on a very large scale. In these industries the working cost is mainly made up of two items, the interest on the capital outlay and the cost of power consumed. They are essentially power industries, which can only be carried on where very large amounts of power can be obtained at rates below those usual in industrial centres. While for ordinary industrial operations a continuous supply of power throughout the year is essential, it may, perhaps, be practicable to shut down these highly specialised industries for two or three months in the year, during the period when the water supply is at its lowest level. This would increase the number of probable sites for hydro-electric stations by diminishing the cost of storage works.

The storage of water for irrigation is well understood, and the general principles underlying its successful application have been thoroughly worked out. It is now necessary to reconsider the question of the storage and regulation of water, with the double object of power supply and irrigation. Irrigation engineers in recent years have not lost sight of this possibility, but are naturally still inclined to regard the power question as one of subsidiary importance, and are, therefore, unwilling to accept any compromises which would involve the sacrifice of irrigation to water power or interfere with their existing régime. Hitherto, prospecting for water power has not been recognised as an essential duty of the Public Works or any other Department, and, as already stated very little has been done; but the necessity for electro-chemical and thermo-electric industries alters the situation.

Reasons why Government should undertake this work.

100. We think it undesirable that the task of prospecting should be left entirely to private enterprise, as in the majority of cases such work could only be undertaken by strong financial syndicates, whose interests would not in some cases coincide with those of the public or of Government. For the following reasons, such work is more appropriately the function of a Government department :—

(1) Only Government can fairly estimate the effect of displacing an agricultural community, which would be the case in most reservoir schemes.

(2) Only Government can readily ascertain the land rights affected, and can adjust conflicting claims, especially where the storage area may be in one province, while the power site, through an accident of topography, may be in another, or even in a Native State.

(3) Only a Government department can afford to undertake the long-period gauging operations that are necessary, especially in the case of rivers like those of the Peninsula, which are subject to great seasonal variations.

(4) Unless a systematic hydrographic survey be undertaken by Government, it will be impossible to formulate precise rules for the grant of concessions, and private companies will, therefore, be compelled ordinarily to ask for exclusive privileges over large areas to forestall imitation and competition. Incidentally it is necessary that these rules should be sufficiently generous to attract private enterprise, without tying up for long periods areas that ought to be prospected, and without allowing large schemes to inhibit activity in the promotion of small local power schemes, or conversely small interests to preoccupy the choicest sites in neighbourhoods which might subsequently be found suitable for larger schemes of more general public utility.

(5) Only Government can initiate and carry through joint and interdependent power and irrigation schemes.

We, therefore, consider it necessary that Government should take in hand a systematic survey of the country to ascertain what hydro-electric possibilities exist, and we are of opinion that this should be started at once in view of the necessity of selecting, as early as possible, the best sites available for certain power industries. Delay to determine the resources of the country in this direction may involve much expenditure which might be avoided with the help of a previous survey. In the absence of adequate data, we refrain from expressing an opinion on the question of the agency to be employed in carrying out such works. The analogy of the Irrigation Department suggests that, when the power is distributed over wide areas and to many consumers, the work should be undertaken by Government; but in other cases, such as the establishment of metallurgical or chemical works by private agency, a single consumer may be granted concessions to enable him to create his own water power. Leases of water power should provide for the resumption or transfer of rights and for the acquisition of the hydro-electric plant on an equitable basis, should it become necessary in the public interest, or should the initial industrial undertaking be compelled at any time to cease working.

Proposals for generating water power from canal falls and other irrigation works should be considered by a joint committee composed of officers of the Public Works and Industries Departments, so that conflicting interests may be adjusted as far as possible, and the utilisation secured of any sources of power which now exist or can be created.

CHAPTER VII.

The Indian in Industries.

The share taken by different classes of Indians in industrial development.

101. We may now examine further the part played by Indians of all classes in the industrial development of the country, in order to ascertain the lines along which this tendency may be further stimulated. In a subsequent chapter we deal with the conditions under which factory labour lives, and show that these are in the highest degree antagonistic to any improvement in efficiency. These conditions are not easy to alter; but it is obvious that the great obstacles are the lack of even vernacular education and the low standard of comfort. The higher grade of worker, the mechanical artisan, in the absence of adequate education has also been prevented from attaining a greater degree of skill. He finds himself where he is, less by deliberate choice than by the accident of his obtaining work at some railway or other engineering shop, or by the possession of a somewhat more enterprising spirit than his fellows. There is at present only very inadequate provision for any form of technical training to supplement the experience that he can gain by actual work in an engineering shop, while the generally admitted need for a more trustworthy and skilful type of man is met at present by importing chargemen and foremen from abroad.

Traders, employers and financiers differ very widely throughout the country in efficiency and in the degree of success which they attain. This must be ascribed to the fact that, in the absence of a proper system of industrial education and a considered policy of encouragement to industries, hereditary predisposition and the influence of surroundings have been left to produce their inevitable effect. The castes which exhibit the highest degree of intelligence are, with few exceptions, those whose functional characteristics have in the past been religious leadership, government service, or trade, and it is from these that the leading Indian industrialists, financiers and merchants have hitherto been mostly drawn. Though the representatives of these classes have attained a high degree of success in Bombay and Gujerat, and though there are numerous instances of successful Indian industrial enterprise in other parts of the country, Indian capitalists generally have followed their ancestral tradition of rural trade, and have confined themselves to the finance of agriculture and of such industries as already existed. When communications were improved and India was brought into effective touch with the outside world, traders took advantage of the changed position merely to extend the scale of their previous operations. Like

the landlords, they lent money to the cultivators and found a profitable investment in landed property. In trade and money-lending and, to a less extent, in financing village artisans, the trading classes found that large and certain gains were to be made; while modern industries required technical knowledge, and offered only doubtful and, in most cases, apparently smaller profits. The failure of the more intellectual classes to take advantage of the new prospects was especially marked in Bengal, where it contrasts with the success of local European enterprise. Here and in most parts of India, these classes grasped eagerly at the prospect of Government, professional, and clerical employment, and freely availed themselves of the system of education which was brought into being by the British Government, partly with a view to fit them for that very work. The effect of the purely literary type of education which was the only one generally provided, has been so frequently discussed that it is not necessary to pursue the subject here in detail; it is, however, very necessary to realise its importance as a factor which has militated against industrial development, and to emphasise the necessity for a system of education which will impart a practical bias to the minds of Indian youths.

Exceptional position in Bombay.

102. The state of affairs in Bombay is altogether different. If the cause be sought, some indication of it may be found in the fact that Indians have held a large and important share in the trade of Bombay since the city first came into English hands. The Mahomedans of the west coast, especially, traded by sea with the Persian Gulf, Arabia and East Africa from much earlier times. The Parsees and Hindus from the northern Bombay coast districts are recorded, at the beginning of the British occupation, as taking, with the Mahomedan sects of Khojas, Memons and Bohras, a most important share in the trade of the port as contractors, merchants, financiers and shipbuilders, and have throughout shown themselves little, if at all, inferior to the Europeans in enterprise, and usually in command of more capital.

The valleys of the Nerbada and the Tapti had been for ages devoted to the cultivation of cotton. A considerable export trade was carried on from Broach and Surat, the ports at the mouths of these rivers, with the aid of an efficient maritime population. The Parsees also after settling in this tract secured a share of the trade. With the silting up of these rivers and the increase in the size of ships, Bombay became the centre of the export trade from the west coast of India. The import of coal from England facilitated the starting of the first cotton mill in Bombay in 1851 by a Parsee, Mr. C. N. Davar. The number of mills increased slowly at first, and it was not till the cotton boom of the early sixties had come and gone, and the value of steady industrial investments had made itself appreciated, that it became considerable. By 1876 it had risen to 29, and the manufacture of cotton had become accepted as a safe and profitable investment for capital, while by 1889 it had increased to 69, after which came a lull, but a further rapid rise took place after the year 1895, and the subsequent expansion has been conti-

nuous. Much of the capital invested was derived from the profits made in the opium trade with China, and, of course, from the money which the cotton boom brought into Bombay. The cloth trade with Africa and Arabia and the yarn trade with China had become important by 1882. The closing of the Indian mints in 1893 to the free coinage of silver, together with the industrial development in recent years of Japan, which now not only supplies its own needs but is a keen competitor with India in the China yarn market, have to some extent retarded the rapidity with which the Bombay yarn industry was previously expanding, and have turned the attention of those interested in it to the production of cloth on a larger scale. At the present time, the number of mills controlled by European interests is trifling, and the proportion of European mill employés also tends to decrease. The marked contrast between the trading and industrial position of Indians in Bombay and Calcutta, and the light thrown thereby on the important question how to assist the Indian people, generally, and educated Indians, in particular, to take an increased share in industrial enterprise, must be the excuse for a somewhat prolonged discussion of this subject.

It is noteworthy that in many cases the classes most successful in industrial and trading enterprise do not care for employment of a nature demanding skill in industrial technique. In some parts of India, Brahmins, though less engaged in trade, produce a fair number of engineers and other skilled industrialists. It is not in manual skill, if they care to acquire it, or in the capacity for understanding technical problems, that the castes which have in the past sought knowledge rather than commercial success, are deficient; it is rather in enterprise and in business sense, qualities which cannot be developed by a purely literary education and are more dependent on youthful environment. A few individuals, possessed of greater determination or aptitude than their fellows, have, however, achieved varying degrees of success.

The *swadeshi* movement.

103. A brief account of the *swadeshi* movement, a popular effort to promote indigenous industrial enterprise which was taken up by the educated classes in most parts of India, though especially in Bengal, will illustrate both the desire of more advanced Indians for the industrial progress of their countrymen, and the causes which have hitherto combined to prevent their realising this ideal to any great extent.

The necessity of securing for India the profits which accrue from the manufacture of her raw materials, to the export of which her commercial activity has hitherto been mainly confined, had for many years been urged on the Indian public by Europeans as well as by Indians. Among the latter, the late Mr. Justice Ranade was the leading exponent of the new views, which involved an appeal to Indian capitalists to invest their funds more largely in industry, and to the younger members of the literary castes to abandon their traditional aversion from manual labour and to fit themselves for industrial enterprise. The Indian Industrial Conference, started in 1905 expressly to further this cause, has met regularly every year since, and has devoted itself to the dissemi-

nation of industrial information and to a propaganda of its views among the educated classes. At a slightly later date, *swadeshi* principles began to receive the support of the more advanced Indian politicians, especially in Bengal owing to local causes. The success of Japan in her war with Russia appealed strongly to the imagination of educated Indians, who saw in Japanese progress and efficiency an example of what could be accomplished by an eastern nation. It was to the policy of the Japanese Government that the great industrial advance of Japan was ascribed by them, and numerous Indians began at this time to repair to that country for industrial training. These causes led to the increased use of Indian goods and to the starting of small factories by Indians, especially for the manufacture of piece-goods, soap, matches, pencils, and cutlery, and of stores where the products of these factories were to be sold. This was in itself a laudable idea, and it was financially supported by many persons who were entirely free from all extreme political views. But the boycott of foreign goods, which was the form given to the movement by some of its more advanced supporters, carried with it the elements of failure, by alienating in many quarters the sympathy and support which it might otherwise have claimed.

104. The original movement also suffered from serious errors. Too many of its disciples were apt to suppose that, because an article was manufactured abroad and imported into India, it could necessarily be made in India at a profit. Unfortunately also, the promoters of the newly established concerns lacked business ability and practical experience, and overlooked the fact that the imperfect theoretical knowledge of an industry, acquired from the study of books or even in technical institutions, is an insufficient equipment for undertaking manufacture on a commercial scale. Professional men and landowners put money into businesses that commanded no better technical direction and expert knowledge than those of youths half trained in this way. Even where more experienced men were forthcoming to carry on the actual work, the industry or its location was too often selected by its promoters without a due consideration of the economic factors involved; and concerns were frequently started with inadequate capital. For reasons which are discussed in the next chapter, Government was unfortunately not equipped to meet the tide of enthusiasm half-way; to guide it to success by expert aid and business advice; and to place the country on the path of sound industrial development by the provision of systematic technical and commercial education. The *swadeshi* movement thus resulted in numerous failures, almost always due mainly to lack of business aptitude and commercial and industrial experience in classes which had had no opportunity of acquiring them. It says much for the strength and soundness of the feeling which underlay the effort, that it still remains to some extent effective, and that a few professional men and landowners are still found, in Bengal and elsewhere, who support *swadeshi* enterprises with such capital as they can afford.

CHAPTER VIII.

Government Industrial Policy in Recent Years.

History of recent Government policy of industrial development.

105. The commercial instincts of the East India Company had from its earliest days in this country led it to make various attempts to improve those Indian industries from which its export trade was largely drawn, as, for example, by organising and financing the manufacture of cotton and silk piece-goods and silk yarn, although this policy met with opposition from vested interests in England, which were at one time sufficiently powerful to insist that it should be suspended and that the Company should instead concentrate on the export from India of the raw material necessary for manufactures in England. The effects of this traditional policy continued for some time after the Company had ceased to be a trading body, and even after it had been replaced by the direct rule of the Crown, and doubtless moulded such subsequent efforts as were made in the same direction by Government. But as *laissez-faire* views gradually gained increasing acceptance both in England and in India, these spasmodic efforts became less frequent, and the first attempt at a general policy of industrial development took only two forms—a very imperfect provision of technical and industrial education, and the collection and dissemination of commercial and industrial information. One expression of the latter policy was the Calcutta Exhibition of 1884-85, which led to the institution of the Calcutta Commercial Museum, now part of the Indian Museum, and to the examination of Indian industrial resources by the Reporter on Economic Products. Sir George Birdwood's work on the "Industrial Arts of India," the "Indian Art Journal", the Indian and Colonial Exhibition held in London in 1886, and the institution about 1890 of a series of provincial monographs on Indian industries may be regarded as isolated and desultory efforts in the same direction. Various experts also were employed to investigate matters of industrial importance and awaken interest in them, while the Geological Survey began to deal with the economic uses of minerals, a branch of its work which was more definitely systematised from about the year 1904.

All that was done, however, was due rather to a few far-sighted individual officers than to any considered and general policy on the part of Government, though it is true that Government recognised the need for such a policy by the creation in 1905 of a separate imperial Department of Commerce and Industry. Even so, it is believed that this department by no means took the form originally contemplated by Lord

Curzon, the Viceroy responsible for its inauguration. It is to the initial phases of this movement and to the severe set-back which it received in 1910 from a decision of the then Secretary of State, after detailed proposals for organisation and work had been actually elaborated in the United Provinces and Madras, that we now desire to draw attention.

United Provinces.

106. In 1907, a conference was held at Naini Tal by Sir John Hewett, Lieutenant-Governor of the United Provinces, who had been the first Member in charge of the new Department of Commerce and Industry. The proposals accepted at this conference included the appointment of a provincial Director of Industries, advised by a board of officials and business men, whose main functions were to be the acquisition and dissemination of industrial information, the introduction of new and the stimulation of existing industries. For these purposes the Director was to be provided with an expert staff, and to have the control of industrial and technical education and, in particular, of a technological institute to be established at Cawnpore, the professors attached to which were to assist by investigation and advice in the solution of industrial problems. With the help of the staff of the technological institute, the Director was to pioneer new industries and to experiment in improved methods and demonstrate their application to certain existing industries on a commercial scale. In their Resolution No. 1163-XVII-415, dated 27th August 1913, the United Provinces Government reviewed the extent to which subsequent experience had led them to modify their ideas, which had, however, only been carried into effect to a very limited degree. Their most important conclusions were that the headship of the technological institute should be separated from the Directorship of Industries, owing to the fact that a scientist was clearly needed for the former and a man of general industrial and economic knowledge with a business instinct for the latter; and the recognition of the truth that the science of directing organised industrial concerns can only be learned by experience, and not in technological institutes, however elaborate their equipment.

In pursuance of the recommendations of the Naini Tal conference, loans or grants were given to several concerns, especially to sugar factories. Some of these were spent, under the advice of the Government Sugar Engineer, in remodelling existing factories. The inevitable difficulties besetting these early attempts to assist industry, in the absence of a properly considered and accepted policy or of a systematised organisation to give effect to it, are well exemplified by the history of the loan given for starting a sugar factory in the Gorakhpur district, and of the experimental cotton-seed oil factory at Cawnpore. The loan of seven lakhs of rupees was granted to the sugar factory in the hope that it would induce capitalists to establish cane factories on modern lines. It does not appear to have had any marked effect in this direction, nor in the training of Indian apprentices as sugar makers, which was one of its conditions. Though the proposal was examined and reported on in the first instance by the Sugar Engineer to Government and the Director of Agriculture, the terms of the loan did not bind the company

to accept advice from, or even to permit inspection by, any Government officer. The machinery and the process adopted were not in all respects suited to Indian conditions ; the first season or two were unfavourable, and the enterprise naturally suffered at first.

The Government pioneer oil mill was started at Cawnpore under the management of a European agency firm, to investigate the possibility of the extraction of cotton-seed oil on a commercial scale. The venture was initiated without the assistance of any expert in cotton-seed oil manufacture, and was subsequently closed down in consequence of orders of the Secretary of State of which more will be said below. The mill had not worked long enough to yield definite data of commercial value, though the results were said to be promising It was made over to private owners, who found it necessary to modify the plant installed by Government, which was not of the most suitable type for its purposes.

Madras.

107. In the early nineties of last century, proposals that the water power, which would become available on the completion of the Periyar irrigation project, should be utilised in the manufacture of aluminium by the then new electrolytic methods, had awakened interest in the Madras Presidency. Nothing has come of these proposals, and to this day the water power remains undeveloped ; but in 1898, Government sanctioned experiments at the School of Arts in working up sheet and ingot metal procured from the British Aluminium Company to determine whether the metal would prove useful to the people of India, and, if so, to build up a market for it in the country, which would justify the establishment of hydro-electric works for its production from Indian ores. It was thought that, if aluminium could be smelted in India, it might prove a convenient substitute for copper, brass, tin, zinc and lead in many of their industrial and domestic applications. The average yearly imports of copper and brass from 1891 to 1896 had been over 24,000 tons with a value exceeding two crores of rupees, and it appeared well worth while to make some attempt to introduce a metal, which could ultimately be manufactured in the country, as a substitute for those which, as it then seemed, must be imported. In the course of six years, a fairly large business in aluminium hollow-ware was developed, and a demand was created which led to the establishment of a number of small factories in other parts of India. At the end of 1903, the Madras Government considered that they could not usefully carry on the work any longer, and they sold their plant and stock *en bloc* to the Indian Aluminium Company for a lump sum which left them with a clear profit of Rs. 30,000 on their experiment. The imports of the metal thereafter steadily increased, and in 1912-13 amounted to nearly 1,800 tons valued at over 25 lakhs of rupees, but the outbreak of war seriously restricted further progress, and the prohibition of imports of aluminium in 1916 necessitated the closure of the factory, at least temporarily. The experiment has not yet achieved its original object, but it has created a large market for aluminium in India which is a desirable preliminary to the establishment of works in the country for the extraction of the metal. During the five years

1911—1916 (in two of which operations were seriously affected by the war) 5,737 tons of aluminium, valued at over 89 lakhs of rupees, were imported.

The success which attended their initial industrial endeavour led the Government of Madras in 1899 to obtain sanction from the Secretary of State to the appointment of a whole-time officer, to supervise and stimulate technical and industrial education. In the first instance, the appointment was sanctioned for three years and was renewed for a similar period, and finally, in 1906, was extended for a further period of five years, when the officer was designated the Director of Industrial and Technical Enquiries. A detailed history of the work in Madras has been prepared under the orders of the Local Government and submitted to us as a "Memorandum on the Department of Industries in the Madras Presidency" (Appendix J). From this memorandum it will be seen that step by step the Madras Government committed themselves to an increasingly active policy for the promotion of industries. Hand-loom weaving was greatly developed, the chrome process of manufacturing leather was introduced, irrigation by pumping was started and boring for water was undertaken; in addition, an organisation was created for assisting private individuals to install power-driven machinery and plant. These numerous activities aroused the opposition of the local European commercial community, who interpreted them as a serious menace to private enterprise and an unwarrantable intervention on the part of the State in matters beyond the sphere of Government; on the other hand, the Indian public approved of the policy which had been pursued.

Effect of Lord Morley's despatch of 1910 on industrial policy.

108. There were, however, certain incidents in the history of the development of industries in Madras which merit special notice. An industrial conference was held at Ootacamund in 1908. The Madras Government Order No. 2894, dated 17th October 1908, reviewing its recommendations, appointed a special officer under the title of Director of Industries, to control pioneer enterprises and practical industrial education, and to establish a bureau of industrial information and an industrial museum. The conference had recommended that he should be assisted by an Advisory Board. Technical education was to remain under the Director of Public Instruction. But when the scheme was laid before the Secretary of State (Lord Morley), the essential feature of experiment and demonstration by Government agency on a commercial scale entirely failed to secure his approval. In his despatch No. 50-Revenue, dated 29th July 1910, Lord Morley said that the results of the attempts to create new industries were not of a character to remove his doubts as to the utility of State effort in this direction, unless it were strictly limited to industrial instruction and avoided the semblance of a commercial venture. The policy, which he was prepared to sanction, was that State funds might be expended upon familiarising the people with such improvements in the methods of production as modern science and the practice of European

countries could suggest. Further than this the State should not go, and it must be left to private enterprise to demonstrate that these improvements could be adopted with commercial advantage.

Lord Crewe, who followed Lord Morley as Secretary of State for India, in his despatch No. 24-Revenue, dated March 12th, 1912, expressed views somewhat divergent from those of his predecessor :—

> " The creation of a separate Department of Industries in the Madras Presidency must turn on the question of the functions proposed to be assigned to it. As regards the latter, I must reaffirm my predecessor's decision against the extension of its activities to trading on commercial lines. I have no doubts as to the wisdom of that decision. At the same time I desire to point out that the Government of Madras appear to have placed too limited a construction upon the orders given in my predecessor's despatch of 29th July 1910. The policy which he then sanctioned was that State funds might be expended upon familiarising the people with such improvements in the methods of production as modern science and the practice of European countries could suggest. This need not be interpreted as confining instruction solely to industrial schools. I am prepared to recognise that in certain cases instruction in industrial schools may be insufficient and may require to be supplemented by practical training in workshops where the application of new processes may be demonstrated ; and there is no objection to the purchase and maintenance of experimental plant for the purpose of demonstrating the advantages of improved machinery or new processes and for ascertaining the data of production. I have, for example, in view the experiment which the Government of the United Provinces is now carrying on with a small sugar plant. Such an experiment does not exceed the limits within which the Government of Madras may promote the industrial development of the Presidency."

Lord Crewe stated in addition that he was prepared to sanction the constitution of a Department of Industries on the lines subsequently laid down in the Madras Government Order No. 368, dated April 1st, 1914, where the functions of the Director of Industries are defined as follows :—

(1) to collect information as to existing industries, their needs and the possibility of improving them or of introducing new industries ;

(2) to carry out and direct experiments connected with such enquiries ;

(3) to keep in touch with local manufacturers, to bring the results of his experiments to their notice and to obtain their cooperation in the conduct of operations on a commercial scale ;

(4) to supervise the training of students ; and

(5) to advise Government with regard to technical matters involving legislation.

109. Even after Lord Crewe's despatch the Government of India seemed to be in doubt as to how far they would be justified in sanctioning proposals for demonstration plants, financial assistance and other forms of direct aid to industries. Their desire to move in these matters, which had not so far reached the stage of active fulfilment, had received a decided set-back. The difficulties were increased by the fact that they had neither the organisation nor the equipment to give effect even to the comparatively limited policy sanctioned by Lord Morley. It was not, however, till some time after the outbreak of war that they resolved to examine the question in a comprehensive way, and to that end appointed our Commission.

The attitude of Government did not satisfy the important section of Indian public opinion which desired the industrial regeneration of the country. The reversal of the policy enunciated by Lord Morley was frequently demanded ; and the success of Japanese industries, brought home forcibly to India by a very large increase of Japanese imports, was cited as an instance of what a previously backward eastern nation could accomplish with Government encouragement.

Subsequent history of Government action. Eastern Bengal and Assam.

110. The Eastern Bengal and Assam Government held a conference at Dacca in 1909, which made certain proposals involving the creation of a Department of Industries and the establishment, in connection with a scheme for technical and industrial education, of a central institute at Dacca, one function of which would be to impart, with the help of small Government factories grouped round it, practical training under commercial conditions. The introduction of pioneer factories was also proposed. The Secretary of State (now Lord Crewe) expressed general approval in his despatch No. 12-Public, dated 19th January 1912. A scheme had also been devised for a technological institute at Calcutta ; but owing to the readjustment of the boundaries of the Bengal provinces in 1912, it was found necessary to recast both these schemes, and with this object a report was prepared in 1913. No practical effect has so far been given to these proposals, which have been criticised in paragraph 219 of the Bengal District Administration Committee's report as tending to give too purely educational a bias to the objects and methods of the Department of Industries.

United Provinces.

The United Provinces Government appointed a Director of Industries in 1910, and further loans were subsequently made to various industrial concerns by this Government. A depôt for the sale of the products of cottage industries was started at Cawnpore ; a glass worker and a press-tool maker were obtained from England ; and various investigations were made into the possibilities of certain local products, notably dyes and tanning extracts.

Directors of Industries have been appointed by the Governments of Madras, the Punjab, Bengal, Bombay and the Central Provinces. These appointments have been filled, at any rate temporarily, from the Indian Civil Service.

Other Provinces.

In Madras, the Industrial Department was broken up, after the receipt of the Secretary of State's orders of 1910, into a Pumping and Boring Department directly under Government, and an Inspectorship of industrial schools under the Department of Public Instruction. Both these branches were for a time under the control of the same officer, who was assisted by dyeing and leather experts in other work which he was also detailed to supervise. The Industrial Department was reconstituted with effect from 21st March 1914, but owing to various causes little progress has been made in the work under the charge of the dyeing and leather experts, though a central institute for dyeing, weaving and metal work in Madura is under construction, and a tanning and leather school has been in existence for some years. After the outbreak of war, the Madras Government thought that an effort should be made to take advantage of the temporary cessation of foreign competition to start new industries and revive certain ostensibly promising industrial ventures which had previously failed. The manufacture of glass, paper and pencils, and oil-seed milling were attempted, but unforeseen difficulties arose from inability to obtain plant and the services of suitable experts. The glass experiments completely failed, and the attempt to introduce modern methods of milling oil seeds, owing to non-delivery of the machinery did not advance beyond the experimental stage, the results of which were favourable. The manufacture of paper was started again at Punalur, and, after unsatisfactory experiments with a number of Indian woods, the pencil factory set up in Madras has achieved considerable success with cedar wood imported from British East Africa.

Madras.

In Bombay, an Advisory Committee was appointed in 1915 to report on such schemes as were submitted for its approval, and advise the Government as to the support which should be extended to these. At the beginning of 1918 this committee was dissolved at its own suggestion and replaced by a Director of Industries.

Bombay.

In the Central Provinces, the Director of Agriculture in 1911 was appointed Director of Industries also and charged with the main task of aiding certain selected cottage industries. The staff of his department included a textile expert and a European craftsman, who is head master of the School of Handicrafts at Nagpur, and whose duties include the giving of advice and help to local artisans in wood and metal. In 1917, a separate officer was temporarily appointed as Director of Industries.

Central Provinces.

In almost all provinces, the Departments of Co-operative Credit assist cottage industries to organise, finance, purchase and distribute

on co-operative lines. Little, if any, progress, however, has yet been made in co-operative production.

111. Industrial surveys were undertaken at various times between 1890 and 1914 in Bengal, the United Provinces, the Punjab and the Central Provinces. The Bengal Government in particular carried out no less than three, but nothing definite seems to have resulted from any of them except the report. None of these surveys was made by officers with technical knowledge of any industry, and they were all confined to a description of the various provinces from an economic point of view, including superficial accounts of organised industries and more detailed investigations of small and cottage industries, with descriptions of processes, rates of wages, cost of raw material, and prices of and demand for products. The reports usually include proposals on very general lines for the improvement of local industries, with schemes for the organisation of the necessary staff. They are useful only for administrative purposes as reviews of the existing industrial position, and as affording a basis for the organisation of a local Department of Industries. Expert examinations of particular industries also have been made in Bombay, but the publication of the information so acquired has not had much, if any, practical influence on the public.

Industrial surveys.

This account of the efforts made by Government for the improvement of Indian industries shows how little has been achieved, owing to the lack of a definite and accepted policy, and to the absence of an appropriate organisation of specialised experts. Such experience as has been gained in the few attempts which have been made by the Imperial and Local Governments is chiefly of a negative character; much valuable time has been lost, during which substantial advances might have been registered, and the outbreak of war, which should have proved an opportunity to reap the fruits of progress, has served mainly to reveal and accentuate startling deficiencies.

CHAPTER IX.

The organisation of Scientific and Technical Services and the provision for Research Work in India and Abroad.

Existing position of research work in India.

112. In the course of our tours we visited the Forest Research Institute at Dehra Dun, the Agricultural Research Institute at Pusa and the Indian Institute of Science at Bangalore. We also inspected the laboratories and equipment for research work in the Agricultural Colleges at Cawnpore, Nagpur, Coimbatore and Lyallpur. Further we made a special point of ascertaining what facilities existed under the Education Department in schools or colleges, under other departments of Government or privately, for research work, which would in any way promote the industrial development of the country. We also took occasion to enquire to what extent useful work has been done for India by the Imperial Institute, and to what extent it was considered desirable to refer problems to scientific men at home.

We were impressed by the value of the work which has already been done in the organised laboratories, and by the absolutely unanimous opinion which was expressed by all scientific officers as to the inadequacy of the staffs in point of numbers. Everywhere we were brought face to face with unsolved problems, requiring scientific investigation on an extended scale. On the one side, we saw the results accomplished by enthusiastic scientists, which, regarded from the purely economic aspect of the question, have added enormously to the productive capacity of India ; on the other side, we were told by forest officers, agriculturists and indigo planters, engineers and manufacturers of the limitations placed upon the development of their work and the frequency with which they were brought to a standstill by a lack of knowledge regarding matters which could only be ascertained by systematic research work. Such success as has been attained by the Institutes at Pusa, Dehra Dun and Bangalore should not be gauged solely by its pecuniary returns, as the experts employed have had their attention directed to specific problems urgently calling for solution, and those which were likely to yield immediate results have naturally been taken up first.

We do not propose to deal with the general problems of pure scientific research ; but in relation thereto, attention should be forcibly drawn to the striking success obtained by those officers in Government departments whose position has enabled them to specialise in their work.

113. As industries conducted on modern lines, with facilities to keep abreast of developments in other countries, require technical as much as commercial experience and efficiency, it is desirable that each scheme should be examined by appropriate technical specialists before Government grants concessions or promises in advance any form of support to a new industrial enterprise. The absence of such technical officers and the consequent inability to distinguish between the good and the unsound industrial schemes offered, have given rise to undue hesitation in granting reasonable concessions. Frequently, therefore, there has been displayed by Government officials an apparent indifference to industries, which has been confirmed in the public mind by the absence of any openly expressed policy of encouragement.

Scientific advice an essential preliminary to development.

The maintenance of a staff of suitable technologists and scientific experts is thus essential to industrial development. The most prominent deficiency and most promising field is in connection with research work on the raw materials of the country, especially on the vegetable products. As a consequence of the maintenance of a well organised, though small, Geological Survey Department for the past 60 years, our information regarding the mineral resources of the country has reached a relatively satisfactory stage; indeed, there are various mineral propositions that are merely awaiting advances in other directions for exploitation to commence, and Government has, at its command, in the Geological Survey officers, a corps of specialists who can be relied on for the necessary advice as development proceeds.

114. In the case of vegetable products, however, which occur in such enormous quantities and great variety, comparatively little work has been done of the kind necessary to translate the purely scientific data into a form suitable for the investing industrialist. Sir George Watt* has gathered together a mass of material which, in bulk, is evidence of the great amount of work done by him and by many other workers, official and private. But examination of the data concerning any product of probable commercial value generally brings into noticeable relief our ignorance of the very facts that are necessary for satisfactory industrial enterprise.

Research on vegetable products.

Samples of vegetable products have been examined by scientific workers, either in India or abroad; chemical analyses and other tests have been made; but often there is a doubt as to whether the samples were representative, whether they represented the plant at its best, whether similar or better results could be obtained under regular commercial practice, whether the material occurs in quantities that would permit of economic assembly at a suitable place of manufacture, or

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*"Commercial Products of India," published under the authority of the Secretary of State for India by John Murray, 1908, which is a short edition revised to 1908 of Watt's "Dictionary of the Economic Products of India."—Calcutta, 1885-99.

whether the accessory conditions are such as to justify capital outlay. Data such as these are necessary before a wise investor will risk his money in an industrial enterprise that depends on the maintenance of a supply of raw material of the right sort obtainable under favourable conditions.

Reasons why the carrying out of research devolves upon Government.

115. These data, it is true, can be obtained by any private individual or enterprising company, but it is important to remember that the individual or company, who undertakes "prospecting" work of any kind, expects very properly to be paid for each successful find much more than its actual cost: he must cover those of his losses that are due to unsuccessful ventures, and thus each enterprise that is taken up becomes charged with the expenses of those that are abandoned, the capital is correspondingly "diluted," and the industry is handicapped.

For most industries, it is not the chief raw material that gives the wise investor anxiety so much as the accessories. Thus the expert prospector of one substance may find his favourable results of no use, without favourable results of a wholly different class. Further, for general industrial progress the manufacturers of India must be in a position to make use of the results of work done elsewhere; but to apply them to local conditions is often by no means easy. In some instances, the information available is designedly left incomplete and gaps have to be filled in by trials and experiments, whilst the adaptation of methods and processes to Indian conditions and to Indian materials often involves research work of a complex and difficult character. Between the first stage of the inception of an industrial undertaking and its actual realisation there is usually a necessity for scientific and expert control. Much money in the past would have been saved, if the importance of these preliminary investigations had been realised. Ordinarily, no firm can afford to risk the cost of employing the various experts so required in an uncertain venture. This is more appropriately the business of the State, and the survey of its natural resources should be undertaken systematically, not in the form of an isolated series of special prospecting tests, which results in frequent repetitions, with wasteful overlapping of results and embarrassing gaps. The best intentions on the part of Government and a wise policy of industrial encouragement will never have their full value, unless preceded by a systematic survey of the country's natural resources. Private enterprise, however, will follow in a healthy form and with little artificial stimulus, when sufficient information of the right kind is made available in a way that reduces the opportunities of the speculator to prey on a credulous investor. The striking financial results, which followed quickly and directly after the employment from about 1905 of scientific specialists in agricultural research, demonstrate the wisdom of investing in modern science, and indicate also the opportunities that have almost certainly been missed in many other ways that affect the prosperity of the people and the revenues of the State. We have thus no hesitation in recommending

a very substantial increase in the scientific and technical services as essential to industrial development.

116. We have discussed with various witnesses the form of classification and organisation most likely to be effective for the scientific services of a country of the size and varied character of India. The problems of pure research require a high degree of specialisation, which will become more pronounced with the development of the sciences generally. For the practical application of the results of research, however, a wider appreciation of other sciences, an acquaintance with business methods, and sometimes intimate local knowledge are necessary. India has at times had the benefit of both types of scientific men, and for want of official co-ordination has often suffered from both.

Existing lack of organisation in the scientific services.

In addition to a general deficiency of scientific and technical officers, there is a noticeable absence of anything approaching a natural classification of the various classes of experts employed. Scientific and technical officers are employed, sometimes as whole-time officers in an organised and graded service ; at other times as experts on short-term agreements. There is a general want of uniformity and an absence of system about their functions, powers and terms of service. We have found the scientific experts forming heterogeneous groups, with no uniform conditions of service, with no definitely established policy or precise limits to their activities. The result is waste of money in duplicating equipment, absence of combined effort to form satisfactory reference libraries, overlapping of research work on some questions with consequent neglect of others, absence of authoritative check as to the value of results, confusion among the general public, and a disconcerting variety of isolated or short-lived serial publications.

117. If one takes any single science, say, zoology, the problems that arise may be referred, in a purely haphazard way, to any one of many zoologists—to an officer working under the Forest Department at Dehra Dun, to any one of the various kinds of zoologists employed by the imperial or provincial Agricultural Departments, or at the Indian Museum at Calcutta. Not one of these officers has any regular means of knowing what the others are doing ; there is no one to check his results, and no one journal to which outsiders can refer as covering the whole range of zoological research activities in India. The zoological staff of the Calcutta Museum has recently been constituted as a Zoological Survey of India, but there are still more official zoologists outside than within the new department, which consists of only four zoologists.

The members of the Botanical Survey of India are only five in number, but all are largely occupied with extra-departmental duties, while a far larger number of official botanists are employed in quite other departments.

For the various chemical problems that are essential to industrial development in the country, this form of organised confusion exists

even on a larger scale. Chemists are employed by the various provincial Agricultural Departments, but some of them we found to be occupied with problems like dyeing, paper-pulp making and the extraction of drugs, being apparently unconscious of what has been done, and is now being undertaken, in other parts of India. Chemists are employed at the cordite factory near Wellington under the Ordnance Branch of the Munitions Board. A tinctorial chemist is employed under the Director of Industries in Madras, and another under the Director of Industries in the United Provinces. A mineral chemist works under the Geological Survey. One or two metallurgical chemists are engaged as inspectors of steel at Kalimati. Chemists are employed in the Medical Stores Department, in the Mints, in the Forest Department, under the Superintendent of Local Purchases, under the Collectors of Customs, as professors in various Government Colleges, and as chemical analysts to Local Governments, while there appear to be no definite conditions governing the reference of chemical problems to the Imperial Institute in London. Most of these chemists may be required to give authoritative advice on any branch of chemistry ; they are in isolated posts, generally with no official prospects of promotion of a kind that would satisfy any scientific man of energy and ability. It is not within any one's powers to obtain a collective opinion on any chemical question. The permanent official establishments are also supplemented at irregular times by the employment of temporary experts, on the apparent assumption that India has insufficient problems to occupy the life's work of one man in connection with such large industries as silk, tanning, glass, glycerine, paper-pulp, and soap.

Apart from the dissipation of energy due to this unorganised variety, the employment of isolated experts, whether permanent or temporary, results in a waste of money. A scientific service, with a definitely established position, can attract recruits for smaller initial pay than one of unknown prestige. Many of the scientific specialists quickly reach their maximum salaries, and, witnessing the gradual rise in pay and position of their contemporaries in other services, naturally grow discontented and consequently become of reduced value to the country. In view of the fact that no quantitative standard can be established to gauge scientific research, no one can say what the country loses by discontent among its scientific staff.

Classification of scientific officers.

118. There are two principal ways in which scientific officers can be classified, *viz.*, (*a*) by taking the single science subject as the main bond of union, or (*b*) by taking the application of the various sciences as the line of primary grouping. The Geological Survey and the Agricultural Departments are our most satisfactory cases to illustrate each method of classification—the science of geology is the bond in the first case, and the application of such sciences as entomology, botany and chemistry to agriculture in the second.

The Geological Survey is organised and equipped to deal with all problems connected with the development of our mineral resources, namely, the various branches of pure geology required to complete the general geological map of India, mineral statistics, information regarding mineral occurrences, and the conditions under which prospecting licenses and mining leases are granted. The department touches on public education by making its reference museum accessible to the public and by lending officers for short periods as college professors. Three advantages have followed from this compact structure :—

(a) The science as the bond : the Geological Survey.

(1) Everybody in India, whether an official or a private person, knows exactly whether a definite problem does, or does not, come within the province of the Geological Survey ;

(2) The activities of its officers can never overlap those of another department without being noticeable, while no other official, either of the Government of India or under a Local Government, can pose as an authority on mineral questions without obviously trespassing on the functions of a recognised and established department ;

(3) To the rest of the scientific world a member of the Geological Survey always retains his caste as a geologist, and the director of the department occupies *ex officio* an honoured position.

These circumstances add to the prestige of the department and tend to foster an *esprit de corps*, which lends an additional attraction to the service. The department has maintained without interruption, since its foundation, a set of serial publications which, being the only publications of their kind in India, enable it to enjoy the benefit of a monopoly in making exchanges with other institutions abroad. As a result, it possesses one of the most satisfactory reference libraries of its kind. This feature is one of very great importance, for it is difficult to overestimate the value to the department of the certainty with which an officer can rely on his library in following up a line of research in any branch of pure or applied geology.

The scientific officers of the Agricultural Department are bound together by the fact that their various sciences are applied to agriculture. At the Pusa Research Institute the scientific officers include mycologists, economic botanists, entomologists, bacteriologists and chemists. In each of the provinces one finds, in addition to one or two recognised agriculturists, representatives of some one or more of these accessory varieties of scientific officers. We have been impressed with the high quality of officers who have been recruited in this way, and by the keenness which they show. They commence with a higher initial pay, and, up to ten years of their service, they have better prospects than the Geological Survey officers ; but their official prospects are limited to the disap-

(b) Application of sciences as the bond : the Agricultural and Forest Departments.

pointingly short and blind alley into which they entered at an age too young to consider the ultimate aspect of this question. On the other hand, there is no check on the quality or quantity of work done by the various provincial officers. The chemist, the entomologist, or the botanist of each provincial Agricultural Department is a law unto himself, and is without the stimulating influence of other men of the same scientific caste. Although, for example, there is a principal for the Agricultural College at Coimbatore, the scientific officers associated with him, namely, an agricultural chemist, an economic botanist, a mycologist, and an entomologist, form, for research purposes, separate departments, each being free to communicate direct with the Director of Agriculture for the province.

Some of these specialists find it necessary to publish their results in extra-departmental journals. The plant pathologist at Pusa, for example, finds that his most suitable journal is one published at Berlin, and his scientific interests thus tend to become more closely linked with German vegetable pathologists than with his colleagues in the Agricultural Department of India.

A perusal of the list of agricultural publications in India shows the wide field of literature over which the agricultural research worker must range before he can be certain that he has discovered the latest and most up-to-date information on his subject.

The publications of the Agricultural Department fall into two main divisions :—

I. Those issued by the Imperial Department of Agriculture :—

(1) The Agricultural Journal of India. (Quarterly.)
(2) Memoirs. (Occasional) in series, such as Botanical, Entomological, Chemical, Bacteriological and Veterinary.
(3) Bulletins.
(4) Annual Reports, *viz.*—

(*i*) Scientific reports of the Pusa Agricultural Research Institute (including the Report of the Imperial Cotton Specialist).
(*ii*) Report on the Progress of Agriculture in India.
(*iii*) Report of the Imperial Bacteriological Laboratory, Muktesar.

Besides these there are Proceedings of the Board of Agriculture (biennial), those of sectional meetings of the Board, and monographs and books.

II. Those issued by provincial Departments :—

(1) Annual Reports on the administration of the provincial Veterinary and Agricultural Departments.
(2) Annual Reports on the working of the Agricultural Stations.
(3) Occasional leaflets and bulletins on special subjects in English or vernacular for the use of cultivators and others.
(4) Magazines on popular lines in English and vernacular, either conducted by the department or under its patronage.

These are monthly or quarterly, and are designed to keep the cultivators of the province in touch with the work of the department.

At the Forest Research Institute, Dehra Dun, we found a forest economist, a chemist, a botanist, a silviculturist, and a zoologist, each working on his own special lines under a senior Forest officer as Director of the Institute. It is the business of the Forest Economist to detect, if possible, ways for bringing the forest products into greater use for the various technical industries. To make his office of any practical value, therefore, he must acquaint himself with the details of industries like paper-making, match manufacture, the extraction of drugs, essential oils and perfumes, besides having a knowledge of the various uses to which special kinds of timber can be devoted. His activities cover a field nearly as wide as that formerly attempted by the Reporter on Economic Products to the Government of India; and, even if the range of subjects which he is supposed to know were possible to any human being, he would quickly realise that, by devotion to his special work, he must sacrifice his prospects of promotion to the higher posts in the Forest Department. There is also a single chemical adviser, whose research work has indicated the occurrence of valuable chemical materials obtainable from the forests, hardly one of which he can follow to the stage of establishing an industrial proposition that would justify commercial enterprise. His results, obviously, ought to come under review by a chemical service, which would include chemists who could make an independent estimate of their importance, and practical chemical engineers who could give authoritative information as to their commercial value, and thus facilitate the exploitation of the raw products, either departmentally or through chemical manufacturing companies.

Effect of systems of classification on Local Governments.

119. Before balancing the relative merits of these two systems of grouping scientific officers, it is necessary to take into consideration the way in which Local Governments may be affected by the adoption of either. There is no doubt that the second system of grouping officers, according to the practical application of their special subjects, lends itself more easily to the immediate requirements of Local Governments. The Geological Survey is strictly imperial in character and its officers are beyond the control of any Local Governments, but the range of its existing functions could not be undertaken by any Local Government, except by the institution in its province of another department of practically the same size; for the department is no more than large enough to include the necessary variety of specialists, together with an allowance for casualties, unsatisfactory recruits, and leave. On the score of expense alone provincial duplication in this way would be impracticable. Local Governments naturally desire to have control of the scientific officers working in their provinces; they believe that their interests are not always sympathetically considered

by the heads of imperial departments; and the problems awaiting solution are so numerous that no imperial scientific department, as now under-staffed, can satisfy the demands of Local Governments.

Arguments in favour of classification with the science as the bond.

120. Whilst admitting the danger of imperial scientific officers neglecting the immediate demands of Local Governments, we consider that the balance of advantage is distinctly in favour of grouping these officers by their principal subjects in imperial services, while providing arrangements for recognising the provincial claim to paramount authority in applying the results of scientific research. Our reasons are shortly these :—

(*a*) The functions of scientific officers are advisory, rather than executive. Consequently, quality of work is more important than promptness of action, and technical efficiency should be considered before purely local knowledge. One has to remember that, unless a scientific officer specialises, his advice may be harmful.

(*b*) It is not difficult to organise an imperial service so that some of its officers are placed temporarily under the orders of Local Governments or other departments for special investigations of local value or as consultants.

(*c*) Some Local Governments are too small to maintain anything like the required variety of scientific officers, or even of the equipment required for research work; they must always rely on an imperial staff.

(*d*) Local Governments cannot offer the prospects necessary to attract the best type of scientific man; they have no check on the quantity and quality of his work, such as is possible in a large service with a distinguished chief; they cannot create a reference library nor the atmosphere of science, without which most scientific men fail to work and flourish.

(*e*) The chief grievance of Local Governments is due to the fact that hitherto the Government of India has never had a staff sufficient to meet the urgent problems of the provinces. The cure for this is obvious and simple; the scientific services hitherto have been, through failure to appreciate their full value, starved financially.

(*f*) When a provincial scientific officer is found to be unsuitable in any post, it should be possible to effect a change by his return to the imperial reservoir, where his idiosyncrasies can be accommodated. Under the present arrangements, an unsatisfactory specialist employed by a Local Government cannot generally be dispensed with, as the Local Government has no one of the same caste, who can fitly judge of an expert's qualifications.

The constitution of a certain number of scientific services based on the assumption that the science itself is a chief link between all members,

does not prevent the formation of departments, either imperial or provincial, where the application of various sciences is the chief bond of union. To take a single scientific service as an example, many of the problems of tanning are mainly chemical but the technical difficulties in connection with the industry are so varied, the field for research is so promising, and the duty of training young men to qualify technically is so pressing, that we do not hesitate to recommend a special department to develope an industry in which India is conspicuously well supplied with raw materials of all kinds. There is no reason why a department of leather technology, composed of different specialists, should not borrow one, two or more chemists from the Chemical Service, keeping them for long or short periods according to the nature of their work. Similarly, the Geological Survey, the Forest Department, the Agricultural Department and some of the provincial Departments of Industries might obtain the necessary chemical experts by the seconding of appropriately specialised chemists from the general Chemical Service.

Proposed organisation for an Indian Chemical Service.

121. The science subjects that have a direct bearing on industries and seem especially to merit official organisation along lines similar to those of the Geological Survey are chemistry, botany, and zoology. Taking chemistry first, it would be possible, for administrative purposes, to divide the chemists into three fairly compact groups which might be called, (*a*) agricultural, (*b*) organic, and (*c*) mineral chemists. In many ways the agricultural and the organic chemists would overlap, as many of the problems of agricultural chemistry are organic in their character. It is desirable, however, in a place like India, where agriculture is so extremely important, to give this branch of chemistry special consideration. The organic chemists would be occupied largely with problems connected with forest products, drugs, perfumes, essential oils and dyes, leather and sugar. Many of these officers would be eligible to officiate in the agricultural group. The mineral chemists would include metallurgists, the metallurgical inspectors, and the chemists of the Mints and of the Geological Survey. At some laboratory recognised as the headquarters of the service, there should also be at least one chemist who has specialised in physical chemistry, for a chemist of this type would deal with the physical problems connected with both the inorganic and organic substances. It seems to us that Dehra Dun possesses many advantages as a site for the headquarters of this as well as of some other scientific services. The whole of the chemists would be under the control, for scientific purposes, of a senior officer who might appropriately be called Chief Chemist to the Government of India. Under him directly would be the staff of the headquarters laboratory, including the physical chemists, and the specialists not assigned to provincial branches. The other three groups would be under the supervision of three Deputy Chief Chemists. Junior members of any of the three groups would be lent to Local Governments and the principal Government departments for terms normally limited to five years. They would carry on the routine duties required, in some cases

including teaching, and would undertake certain forms of research with the approval of the head of their service. All results of scientific and practical value would be published in a serial recognised as the authoritative publication of the Indian Chemical Service. Such a serial would quickly establish its position in the scientific world and would become a convenient medium for the publication also of papers by private chemists, resulting thus in the formation of an Indian 'school.' At convenient intervals, most or all of the chemists might assemble for a week's conference, which should be open also to manufacturing and private chemists.

Recruitment and terms of service.

122. For the recruitment of these scientific services, we recommend that to the utmost extent possible the junior appointments should be made from science graduates of the Indian Universities, and that the senior and experienced men who will be required to initiate and direct research work should be obtained on special terms from England, when such are not available here. We recognise that there will, at the outset, be some difficulty consequent upon the conditions that will prevail in England after the war, and because of the relatively small field of selection which at present exists in India. As development of science teaching at the Universities proceeds, and opportunities for technical training in India increase, we believe that the necessity for importing specialists will greatly diminish, and that ultimately the services will be mainly filled with officers trained in this country. Recruits for the scientific services, especially the Chemical Service, should be obtained at as early an age as possible, preferably not exceeding 25 years. We should thus secure the University graduate, who had done one or perhaps two years' post-graduate work, whether scientific or practical, but would not yet be confirmed in specialisation. The object of this proposal is to increase the sources of choice, and to make it less difficult for Government to dispense with the services of a recruit, if at the end of his probation he is found to be unsuitable. We assume that the requisite degree of specialisation will be secured by adopting a system, whereby study leave will be granted at some suitable time after three years service, when a scientific officer should have developed a distinct bent. (See also paragraph 334, Chapter XXII.) The creation of imperial services will enable us to pool our requirements in each science and thus reap the advantages of recruitment in a wide field. It will thus be possible, especially in the case of the larger services, to substitute a system of recruitment on a rough actuarial basis, to cover wastage and expansion, for the present *ad hoc* methods, under which vacancies have to be filled, as they occur, and with reference to special appointments, irrespective of the quality of candidates available at the time.

It is not practicable to give a precise estimate of the number of officers required and obtainable in the near future. It will be some years before it will be possible to obtain the full necessary staff in India. In addition there will be similar post-war demands made at home and in the dominions for scientific, especially chemical, experts, which will

render it difficult to obtain suitable recruits from England. It is probable, consequently, that salaries higher than the pre-war rates will be demanded by suitably qualified experts, and for this reason, among others, we urge the speedy organisation of our scientific services on lines that will permit of training and turning to account young Indians who are now taking up science with no very definite object in view.

The chemists graded as 1st class officers and now employed as such by Government amount to just 50, with an aggregate salary bill of just under six lakhs per annum, chargeable partly to Local Governments and partly to the Government of India. There would be no difficulty in allotting profitable duties to about 120—130 such officers, with an aggregate annual salary of about 15 lakhs.

How effect should be given to recommendations.

123. It would be of little practical value to propose a full cadre under war conditions, but the chemical problems awaiting solution are so urgent that we recommend the early institution of measures for organising the research work of the various official and private chemists who are not already fully occupied with important routine duties. It will probably be necessary, at the right time, to appoint a special committee, which should include a distinguished chemist from abroad, to formulate proposals for the permanent organisation and the terms of employment of the new service, and for the location and equipment of research laboratories.

We have described with some detail the kind of organisation which, we think, will be necessary for a chemical service, because chemistry is so obviously and fundamentally essential to many industries.

Organisation of the other scientific departments.

124. Imperial departments for botany and zoology are already established, but, as already stated, they control only a small fraction of the existing official activities, although these, in the aggregate, are manifestly below the requirements of the country. Although agriculture and forestry show most strikingly the need for chemical, bacteriological, botanical and zoological (especially entomological) research and routine operations, these sciences appeared to us to have sufficient direct and indirect bearing on other industries to justify our inviting evidence from appropriate specialists. Among these, there was a general consensus of opinion in favour of the formation of imperial services, such as that proposed by us for chemistry and that which is already in existence for geology.

In the case of botany, the general opinion of qualified witnesses was also in favour of a single compact service, while, in the case of zoology, it may be advisable to recognise in a tropical country like India the large demands for, and high degree of specialisation required in, entomology. Our object of securing the advantages of scientific specialisation without introducing the administrative difficulties of subdivision seems to be met by recognising entomology as a distinct administrative unit.

Mr. T. Bainbrigge Fletcher, Imperial Entomologist at Pusa, has elaborated a scheme which we have published in full (Appendix K), for we consider it typical of the claims which may be put forward for increased recognition by other groups of scientists. In many respects this scheme falls into line with what we regard as the most suitable form of organisation, in view of the fact that it is not practicable to provide sufficient special entomologists for each of the various groups of insects, as well as for the application of the subject in a country as large as India. We consider that he has established a fair claim for a more thorough recognition of entomology and has given good reasons for the maintenance of a minimum staff of 20 superior officers.

We hesitate to offer suggestions in greater detail regarding the organisation of the imperial scientific services for bacteriology, botany and zoology, as we consider that the best plan will be the appointment of special small committees for the purpose of formulating proposals. These committees might appropriately include, in each case, a distinguished specialist from abroad. In our opinion, research work and science teaching must be intimately associated, and there should be a close connection between the organised services that we are proposing and the educational institutions of University rank in which science is taught. We have already stated that ultimately the services should be mainly recruited from the Indian Universities, and we hope that the Universities will in many instances find it advantageous to obtain their professors by borrowing men from the scientific services, either for short periods or permanently. We have little doubt but that the careers which will be open to officers in these services will provide them with excellent opportunities of obtaining a wide range of practical experience both in research work and in industrial methods, and that, for this reason, they will attract many of the best University graduates. Whilst the services would offer a permanent career to perhaps the majority of men admitted to them, we contemplate that many would regard service in them as preliminary to independent work outside, either in public institutions or on private account. At the present time, there are few openings for scientific men except those offered by Government; but as time goes on and the industries of the country expand, there will be a steadily increasing demand for scientific experts on the part of large manufacturers. The proposed scientific services would enable this demand to be met, and we can suggest no equally effective means of providing for this future need so long as Government continues to be the chief employer.

Relations of scientific officers with the Education Department.

125. Scientists in the Education Department are at present recruited as members of the Imperial Educational Service through the Secretary of State for special "professorships." This system, although it has advantages over the former practice, which had less regard to the needs of modern specialisation, involves certain obvious drawbacks. The professors are comparatively young when recruited, and naturally develop, under novel conditions of life and

work, new professional interests which may or may not coincide with the interests of their environments. We suggest that certain of the obvious drawbacks of the present system would be eliminated by seconding from the scientific and technical services suitable officers to act as professors for, say, five years in the various high-grade colleges under Government or University control. The advantages which such a system offers are mainly these :—

(1) There would be no necessity to recruit young and inexperienced officers through the Secretary of State or appointment boards in London, and it would greatly increase the prospects of obtaining suitable Indians for such posts.

(2) The professors would have in view a clear idea of the connection between the scientific and industrial needs of the country.

(3) They would remain in touch with their own respective services in selecting subjects for research.

(4) They would be better able more directly to train students who show the qualities that are suitable, as recruits for the imperial services.

(5) This system would have the advantage of giving a change of occupation to those who may tend to become stale and narrow through uninterrupted continuance in teaching under the same surroundings ; while, by transference from the ordinary official service to colleges, technical officers obtain an opportunity of renewing in a well-proportioned way their general knowledge of their special professional subjects, and the practice of teaching will bring them into contact with new and important interests, namely, the training of young men for professional careers. As members of services that come into contact with industrial life, they will have far better opportunities than isolated professors of securing suitable employment for their students.

We are of opinion that a system such as that indicated above, if worked judiciously, will result in mutual advantage to the Education Department, to the Universities, and to the special scientific services ; it affords an opportunity for recognising the necessity of specialisation without the narrowing and deadening results which follow over-specialisation; it permits of accommodating peculiarities of temperament, which may not be foreseen at, or may develope after, the time of recruitment ; and it offers the small but important advantage of helping the colleges to form collections of illustrative samples from duplicates that can be spared by the imperial scientific services.

Position of scientific officers serving under Local Governments.

126. We consider that the head of a scientific service should relinquish all administrative authority over any of his scientific and technical officers who may be transferred for service under a Local Government or under some department of the Government of India.

We do not think it practicable to formulate rules applicable to all such services regarding questions like programmes of research work, inspection of results and forms of publications, but we suggest the following general principles as necessary to ensure the maintenance of professional standards, with due recognition of local administrative authority :—

(1) Whenever it is possible to lay down for any scientific officer a programme of research work, the local authority should not sanction it without consulting the head of the appropriate scientific service. This will prevent unnecessary overlapping or waste of time in taking up problems that are known to the central authority, from wider experience, to be infructuous.

(2) The head of a scientific service should have the power to inspect the scientific work of any of his officers who have been transferred to the control of a local authority, but his report should be made to the latter, who alone would retain the power of interference.

(3) Reports on research investigations, of a kind ordinarily suitable for publication, should be reviewed by the head of the scientific service concerned and should not be published without his consent. Ordinarily, such reports should be given their first formal publication in the recognised journal of the scientific service. This rule will not prevent the issue by the local authority of administration or operation reports, or the local reprint for popular use, either in full or in abstract, of papers already formally published in the authorised journal of the scientific service; but it must be remembered that local and popular journals will not ordinarily be recognised by workers in other countries and, therefore, will not serve to secure precedence or to justify quotation in scientific literature. It is important, therefore, to maintain the position of the authorised central journal, and to ensure its being made as nearly as possible a complete and authoritative record of scientific results; such a central journal will soon establish itself as the official gazette for its own branch of science in India, and its recognition will remove any temptation or excuse for publishing in foreign journals.

Research Work in India.

Relations between research officers and industrialists.

127. The preparation of an extensive programme of research and the employment of a number of officers on the solution of problems involving large possibilities to private trade necessitate the consideration of the relations between these officers and the industrial interests which they are intended to serve. The following points will certainly arise :—

(1) The nature of the assistance to private enterprise and the extent to which it should be given.

(2) The publication of the results of work, whether forming part of the regular programme of a Government department or undertaken on behalf of private individuals.

(3) The right to private practice in consulting work on the part of officers employed by Government.

(4) The payment of fees for work done on private account in Government research laboratories.

(5) The best means of encouraging private firms or individuals to set up on their own account as consultants.

We have considered these suggestions carefully and discussed them with various authorities during the course of our tours, and agree that the following general rules seem best to suit conditions as they exist now in India.

(1) Specialised research institutions and laboratories, such as those belonging to the Forest and Agricultural Departments, will generally not be in a position to take up work on private account. In the case of the former, almost all the work is already done for Government, which is by far the largest forest proprietor in the country ; in the case of the latter, the individual agriculturist works on a small scale and on a non-competitive basis. On the other hand, the Indian Institute of Science and the various research institutes that have been suggested will normally be employed on a great variety of problems received from many sources, and there is no reason why applications for assistance from private persons should not be entertained. Besides furnishing solutions to problems requiring specific researches, these institutions will also prove extremely useful to the public as repositories of technical and industrial information, and suitable regulations should be framed to encourage *bonâ fide* applications for assistance and information.

(2) Of the advisability of the publication of the results of research in pure science, there can be no doubt ; and generally there is no disadvantage resulting from the systematic publication of the results obtained in what may be termed 'non-competitive' development work. The matter is altogether different with industrial researches which may yield results of great pecuniary value to the possessor, so long as they are in the nature of a monopoly, but may often lead to competition injurious to him directly they become public property. We consider that the results of all research work carried on in Government institutions should be regarded as the property of Government. The decision as to the expediency of publication or otherwise should rest with the controlling authorities ; and it will be desirable in the interests of all concerned to reach a clear understanding, at as early a stage as possible, on this subject in each case. We desire to lay stress upon the fact that instances may often occur in which it may be found undesirable to publish broadcast the result of industrial research, without in any way precluding its confidential communication to persons who may be interested in it, or who may be in a position to make use of it advantageously.

The data for research must, in the absence of any definite agreement on the subject, be considered to be the property of the applicant, and the question of their publication should be governed by recognised professional etiquette.

We are conscious that the above prescriptions will deter some persons from coming forward with requests for assistance ; but these will be as a rule the large-scale industrialists, who are in a position to engage private consultants. The smaller operator, who will benefit most by this form of help, is usually working on a less competitive basis.

(3) We consider that the scientific services, which we propose to create, should be sufficiently well remunerated and should offer sufficient prospects to their members to render it unnecessary to engage them on terms other than those which have been found suitable for such branches of the public service as the Public Works Department ; that is to say, private work for extra remuneration should not be undertaken without permission, which should only be granted sparingly and for exceptional reasons.

(4) The principles upon which fees should be levied for work undertaken for private parties are easily stated. Normally, the cost of such work must be paid for on some suitable basis to be agreed upon beforehand. This fee may take the form of a lump sum or of a monthly contribution to cover a share of the salaries to the members of the staff during the time they are employed on the work, or, in some instances, may be a combination of both methods. When a private concern desires to engage a Government research officer as a regular consultant, the question of fees and publicity should be settled on the same basis as for individual consultations. When the research is undertaken at the request of private individuals and is likely to be of public utility, such work should be done free of charge. Intermediate cases may occur ; but they are not likely to be numerous or difficult to decide. A useful concession which might be readily granted to pioneers of new industries or of existing industries undertaken under new conditions, would be the privilege of obtaining not only free technical advice, but also the right to have research work taken up on their behalf in Government laboratories, without charge.

(5) The levying of the full cost of work undertaken on private account is likely to prove the best form of encouragement to the establishment of private, and usually highly specialised, research laboratories. It is the almost complete absence of consulting experts in this country which renders it difficult for Indian enterprises on anything but a large scale to obtain sound and disinterested advice. It will be one of the functions of the Departments of Industries to undertake such work ; but the desirability of encouraging private consultants should always be kept in view, and the policy of the department should be directed towards this end. The growth of a class of private specalists in various forms of technology should, therefore, be stimulated, and Government departments should make use of their services, whenever there is advantage in doing so. We

would deprecate the importation of specialists on short-term agreements, whenever it is possible to engage the services of men already practising in the country; and we recommend as a general policy that Government should, as far as possible, offer encouragement to private consulting engineers and specialists, whenever this can be done without detriment to the public interests involved.

Location of research institutes.

128. The scientific services which we have proposed above will contribute to the organisation of research work throughout India and the correlation of results obtained within their respective sciences. The provision for scientific research clearly postulates that of laboratories and the question therefore arises how those laboratories should be grouped and located. Two main suggestions were put before us in evidence, one that on grounds of economy and to create the scientific atmosphere necessary for research on as wide a scale as possible, all branches of scientific research should be grouped in a single institute; the other, that research institutes should be specialised, so as to bring them as closely as possibly into contact with local industrial problems. A small number of witnesses suggested that research work generally should be relegated to a central institute: the Indian Institute of Science at Bangalore is the outcome of the idea that all sciences are sufficiently related to be brought into one institute.

Constitution of the Indian Institute of Science.

129. But the history of this Institute shows that, where the income is limited, research activities must be confined to a single branch of science, if results of practical value are to be obtained. Originally projected by the late Mr. J. N. Tata with the object of encouraging post-graduate research in pure physical science, it has, in the course of a comparatively short career, developed a distinct tendency towards the study of problems which are likely to lead to results of immediate economic value, rather than towards the pursuit of investigations of purely scientific interest.

The administration of the Institute is somewhat complex owing to the fact that it represents so many interests. Its income is derived from the original endowment, which yields annually Rs. 1,25,000, supplemented by an annual grant of Rs. 50,000 from the Mysore State; while the Government of India contribute a grant-in-aid amounting to one-half of that realised from the other two sources. The affairs of the Institute are managed by a Council, partly nominated by the contributors to the income and partly elected by a nominated Court of Visitors scattered over India. The supreme controlling authority is the Governor General in Council, who exercises his functions through the Education Department; but certain powers are also vested in the person of His Excellency the Viceroy, who is the patron of the Institute.

There are two main departments, one dealing with electric technology and the other with chemistry. The latter is subdivided into three sections, each under a separate professor. The department of electric

technology has failed to attract research students and is, for the present, merely a school for the training of electrical engineers ; but the chemical department is given up to research work which, though not entirely, is, as we have already stated, chiefly of a practical character. The students, though few in number, come from various parts in India, and there are at present no signs of undue localisation in this respect ; but this could not be said of the economic work going on in its laboratories, most of which at the time of our inspection had been taken up at the instance of the Industrial Departments of Madras, Mysore and Hyderabad. The Council of the Institute, through their Director, represented to us that, in their opinion, there was ample scope for developments, and that these would be undertaken as soon as the income of the Institute permitted. It was further suggested that, with adequate support, the Institute might be made the centre of chemical research for all India. We agree that it might be strengthened considerably with advantage but we are definitely of opinion that its value to the industries of India is reduced by its distance from the places in which they are carried on. It is, we conceive, impossible to contemplate chemical research for the whole of India in a single institute, especially one so far removed from the industries which would be likely to require it.

Case for specialised research institutes.

130. India contains, as we have pointed out in Chapter II, a number of industrial towns and areas of varying size and importance, which have in some cases developed in certain industrial directions. We think that, in such cases, some of those centres afford the most promising bases for the establishment of spcialised institutes of research, where the staff can maintain close touch with industrialists and industrial work, and where their investigations will be vitalised by the constant presentation of fresh problems of practical interest. While we consider it inadvisable at this stage to attempt any more precise indication of the places that should be selected for the sites of research institutes, we cannot refrain from drawing attention, not only to the great opportunities for research in a wide range of allied metallurgical and chemical problems presented by the group of works which are springing up near Sakchi, but to the special need which they will experience for assistance of this kind. Industries like the manufacture of iron and steel, which compete over their whole range of production with exactly similar articles produced outside India, and depend for the success of complicated processes on the application to local conditions and materials of principles ascertained and followed under widely different circumstances elsewhere, are far more dependent on local research than the cotton and jute industries. These two industries may be described as operative rather than constructive ; and the evolution of their technique tends rather to develope at present in the countries which manufacture the machinery with which they are carried on. Future progress will clearly be directed towards the introduction of the more refined processes which are already in operation in the United Kingdom, and the extent to which research is needed in India for the improvement of the textile

operations themselves is small. There are, at the same time, certain auxiliary chemicals required for textile work, and some investigation of the local manufacture and use of these is needed. We are in favour of specialised institutes of research, but it is clear that the location of these institutes and the selection of their groups of subjects are questions not free from difficulty, which require to be settled by expert opinion. We consider that the committees which we have proposed for working out the organisation of the scientific services, should include these matters in their enquiries.

Research Abroad.

Dangers of relying on research abroad.

131. Most of the witnesses whose experience entitles them to an opinion recognised the advantages of relying on institutions in the country for the necessary research work on raw materials. In the absence of a sufficient number of the right kind of specialists and for want of equipment, materials have been, in the past, sent for examination at the Imperial Institute and elsewhere abroad. It is obvious that this practice is far from satisfactory and rarely affords the information regarding our raw materials, which is necessary for their commercial exploitation. Much of the work which has been done in this way has been useless, and some of it contains elements of serious danger on account of the fact that the samples examined have not been representative of the average material obtainable in commercial quantities.

132. The study of raw materials required for industries can be undertaken effectively only by suitable specialists working on the spot, where abundant representative material can be obtained and where only the accessory conditions that are essential for commercial success can also be studied. This is especially the case with vegetable products, which change in nature and, therefore, in commercial value at different stages of their growth, and sometimes even during transport over long distances. Preliminary tests by specialists in Europe may often lead to the detection of materials of previously unsuspected value ; but in such instances it is evident, from the nature of the case, that the collector could not have been in a position to know whether his samples were representative. Unless, therefore, such preliminary results are taken upon the spot by properly qualified workers and are confirmed, condemned or developed, their publication must generally become a public danger.

In order, therefore, to make profitable use of any outside institution for research, it is necessary :—

(1) that the samples to be examined should be selected by a qualified authority in India,

(2) that the results of assumed industrial value obtained should be submitted to an appropriate department in India for revision before publication, and

(3) that only specific problems, for which suitable specialists are not obtainable locally, should be referred to institutions or authorities abroad.

The practice of referring samples to the Imperial Institute for technical examination commenced with the Reporter on Economic Products, who (1) organised the collection of commercial samples, (2) maintained for reference purposes in the Calcutta Museum a collection of duplicates, and (3) published for general information the reports received from home. In the absence of anything better, this system served a very useful purpose, in spite of the many mistakes made. Most of the duties which were attempted by the Reporter on Economic Products are now undertaken by scientific officers, especially under the Agricultural, Forest and Geological Survey Departments, and the existence of these specialists in India, with their well-equipped laboratories, renders unnecessary the maintenance in London of a general laboratory for research on Indian raw materials. The office of the Reporter on Economic Products has very properly been abolished, and, as the scientific staff of the Imperial Institute is necessarily without Indian experience and is limited to work on samples doubtfully representative in character, it is obvious that there is no longer any justification for the expenditure of Indian revenues on the Scientific and Technical Department of the Imperial Institute.

Special cases in which problems may be referred abroad.

133. At the same time, there occur, as already indicated, certain questions that necessitate reference to specialists abroad, and problems which recur so rarely that India alone cannot economically maintain in continuous work the equipment required for their solution. To deal with these relatively rare and special cases, scientific officers in the Indian services should be empowered to communicate, through a recognised channel, with the Scientific and Technical Research Department recently established in England. The problems will thus be referred to recognised and authoritative specialists.

CHAPTER X.

Industrial and Technical Education.

134. The history of the evolution in the West of new industrial methods which culminated in the rapid and striking changes of the latter half of the eighteenth century shows that a large part was played therein by the educated as well as by the capitalist classes. The encouragement of scientific research and its practical application by the Royal Society, and at a later stage by the Society of Arts, was closely paralleled by the fresh industrial ventures constantly being set on foot by merchants and other persons with capital at command. When the results began to reach India in the shape of machine-made imports, the movement had passed beyond the stage where imitation might have been easy and where the gradual evolution which had taken place in England could be readily imitated in India. To create an industrial organisation in this country comparable to that of western nations, to build up an industrial community capable of working such an organisation, certain positive measures were required, including the provision of industrial and technical education which we propose to discuss in this chapter.

Reasons why India did not share in industrial evolution of West.

135. The system of education introduced by Government was, at the outset, mainly intended to provide for the administrative needs of the country and encouraged literary and philosophic studies to the neglect of those of a more practical character. In the result it created a disproportionate number of persons possessing a purely literary education, at a time when there was hardly any form of practical education in existence. Naturally the market value of the services of persons so educated began eventually to diminish. Throughout the nineteenth century, the policy of Government was controlled by the doctrine of *laissez-faire* in commercial and industrial matters, and its efforts to develope the material resources of the country were largely limited to the provision of improved methods of transport and the construction of irrigation works. Except in Bombay, the introduction of modern methods of manufacture was almost entirely confined to the European community. The opportunities for gaining experience were not easy for Indians to come by, and there was no attempt at technical training for industries until nearly the end of the century, and then only on an inadequate scale. The non-existence of a suitable education to qualify Indians for posts requiring industrial or technical knowledge was met by the importation of men

from Europe, who supervised and trained illiterate Indian labour in the mills and factories that were started. From this class of labour it was impossible to obtain the higher type of artisan capable of supervisory work. The more advanced Indian thinkers began at last to appreciate the dangers and difficulties of the position. The system of technical education which had grown up on the continent of Europe had already attracted the attention of manufacturers in Great Britain, and it was natural that a demand should be made in India for Government to provide similar facilities. Even when the necessity for action began to be perceived clearly by Government, the magnitude of the problem was hardly appreciated; it was by no means sufficiently recognised that technical education is by itself incapable of creating industries.

Recent attempts to improve technical education in India.

136. It would serve no useful purpose to record in detail the history of the various efforts made by the Government of India and by provincial Governments to provide industrial and technical education suited to the needs of the country. The report of the Indian Famine Commission published in 1880 (paragraph 103), pointed out in striking terms the necessity of a diversity of employment to a country hitherto so largely agricultural. In 1882, the Government of India appointed a Commission to review the existing state of education and to frame a policy for its guidance in the future. The necessity for technical education was realised; but the Commissioners were instructed that to extend their enquiry in that direction would add unduly to the task before them. The publication, in 1884, of the report of the Royal Commission, appointed in England in 1881, focussed the attention of Government on the necessity for stimulating attempts specifically intended to develope the material resources of India and to render assistance to its artisans in the unequal struggle against the products of the factories and mills of the West, which had become greatly intensified by the cheapening of transport, caused by the improvement of marine engineering, the opening of the Suez Canal and the extension of railways in India. In their resolution of the 18th June 1888, on the subject of technical education, the Government of India, pointed out that the education hitherto provided had been too exclusively literary in its bent; that industrial triaining was required in view of the necessity of securing a greater variety of occupations; and that technical education could be provided with advantage at once for industries which had already reached a comparatively advanced stage of development, such as the textile and engineering industries, though the danger of establishing a system of training for those insufficiently advanced was noted. The necessity of giving a more practical bias to general education was emphasised, and Local Governments were incited to take action in these directions. The immediate results were small; but the necessity for science teaching in the colleges affiliated to the Universities was recognised, and the provision for the technical training of engineers was greatly improved. Chiefly through private effort in Bombay, by the amalgamation of various funds, the Victoria Jubilee Technical Institute was

started in 1887 to provide courses of instruction suited to the requirements of the growing Bombay mill industry. Elsewhere and especially in Madras, the provincial efforts were rendered comparatively sterile, owing to the general acceptance of the fallacious idea that it was only necessary to provide facilities for the acquisition of technical knowledge to ensure the subsequent development of industries.

137. At the beginning of the present century, it was realised that measures taken in the Education Department during the previous 15 years had been totally inadequate to meet the needs of India and the growing recognition here of the necessity for a greater diversity of occupations, to absorb the energies of the ever increasing numbers of the educated classes. Lord Curzon accordingly summoned at Simla in 1901 an Educational Conference which reviewed the situation and recommended drastic reforms in the methods of higher education, with a view to render them more effective and practical. Measures were taken in the first place to improve the teaching of the physical sciences. In this line of education great improvements have been effected, and it is now possible, in many of the colleges affiliated to the Universities, to obtain efficient instruction in pure science and to be trained in scientific methods of enquiry and research.

Technical Scholarships Abroad.

Institution of State technical scholarships for study abroad.

138. The Simla Educational Conference also dealt with technical and industrial education; but its recommendations were of little practical value owing to the dominating idea that it was outside the province of Government to take any part in the industrial development of the country, beyond the provision of facilities for acquiring technical education and of information regarding commercial and industrial matters. It was also not recognised by the educational authorities at the Conference that, to produce a class of men of a thoroughly practical turn of mind, it is necessary that the young Indian should be taken in hand at a much earlier age, when the brain is more susceptible to external suggestions. The influence of environment on the Indian school boy of the better classes is probably more important than hereditary tendencies, and the sooner he is brought into contact with constructive activities and taught to use both hand and eye, the more readily will he respond to the measures which may be devised to counteract the sedentary tendencies of his home life. Almost immediately after the Conference, the Government of India appointed a Commission to report upon industrial education; but the report of the Commissioners was never published. A more important outcome of the Conference was the establishment by the Government of India of scholarships to enable Indians to proceed to Europe and America for special training. The scholarships were of the annual value of £150 and were granted in the first instance for a period of two years, which was normally extended for a further year. From a statement furnished to us, it appears that under this scheme more than 100 students have been sent for

foreign training, of whom over 60 have returned to India. The average cost to the revenues of the Government of India of each student who has completed his period of training is about £550.

In March 1904, an association was established in Calcutta for the advancement of the scientific and industrial education of Indians, the main object of which was to enable properly qualified students to visit America, Japan and other foreign countries to study arts and industries. Under this scheme, over 300 students have been sent abroad with the assistance of the association, to the funds of which the Bengal Government contributed an annual grant of Rs. 5,000, reduced, since the outbreak of the war, to Rs. 2,500.

Defects in system.

139. The results anticipated from the grant of these scholarships whether by the Government of India or by the Bengal Association, have only in part been realised. This is due to inherent defects in the scheme adopted, and possibly even more largely in the methods by which it was administered. It was assumed that it would not be difficult for young men from India to get admission into works and factories where they would be given full facilities to obtain practical experience of the methods and processes employed, and opportunities for acquiring an insight into the business organisation which keeps the industry going. It seems also to have been assumed that students from India of fair intelligence and good education would be able to take advantage of these facilities and assimilate all the information placed at their disposal, in a period very much shorter than that which is considered necessary for young men in their own country. In practice, it was found that, while educational institutions were freely opened to the scholars, access to workshops was denied them, except in the case of manufacturing iron works and small industries of no great practical importance. A few witnesses complained of this difficulty, and similar representations were made to the Morison Committee who, in the report on the system of State technical scholarships which they submitted to the Secretary of State in 1913, stated that concerns which possess valuable trade secrets or fear to assist possible competitors, prefer, when they admit learners, to receive men who are likely to remain their employés rather than foreigners. This is an attitude which is common to manufacturers all over the world, not excepting India.

The most successful scholarship holders have been those who, with some previous practical experience of their trades, were able to profit by the courses of technical instruction; but the scholarships have been frequently awarded to young men who had no previous practical knowledge of the industry which they proposed to take up. In some cases they have been allowed to go abroad to acquire a knowledge of an industry non-existent in this country. It is, therefore, not surprising that many promising students have failed to profit by the system, and have found themselves compelled to attempt other means of earning a livelihood. Further, notwithstanding the fact that these scholarships were granted from the public funds for specific purposes, no organisation was

created to ensure that these purposes were achieved, nor was any organised attempt made to help the scholarship holders on their return to India.

140. In the light of the experience gained since these scholarships were first instituted, the Government of India have recently issued revised regulations which should go far to remedy the defects we have pointed out. Local Boards of Selection are to be established in each province; and in the selection of candidates, men of business, Directors of Industries and employers' associations are to be consulted. The object in view will be to obtain candidates whose 'experience and intelligence' justify the expectation that their selection will help in developing the industries of India. Before scholarships are awarded, it is to be definitely ascertained from the India Office that facilities for the acquisition of practical experience can be provided. Educational qualifications have been prescribed which are generally suitable; but these will require some modification to adapt them to the system of technical education which we propose. This does not in all cases predicate courses of study and instructions leading up to University degrees.

Latest rules for State technical scholarships abroad.

The advantages of previous training in India are acknowledged in the new Government rules; but the provisions for giving effect to this principle are not in all cases sufficient.

141. The new rules represent in several most important respects a great advance on the previous procedure; but, in our opinion, scholarships should not be granted in those subjects for which India will provide adequate educational facilities. We may point out, for example, that our proposals in this chapter for the teaching of mechanical engineering would render it totally unnecessary to send students abroad for general training in this subject. Instead, therefore, of allowing, as the new rules do, a scholar to proceed to Europe after one year's training in India, we would prefer that he should go through the more prolonged courses which we suggest at one of the large engineering shops, and that scholarships should only be granted to men who intend to take up some special branch of mechanical engineering which has not yet reached full development in this country. As an instance, we would allude to the absence from India of electrical manufacturing firms, which renders it impossible for Indian students to obtain any real acquaintance with this industry except in foreign countries, although the knowledge so acquired would be of real value in ordinary electrical practice in India. Similarly, the opportunities for training in the textile industries provided by the Victoria Jubilee Technical Institute in Bombay and by the numerous mills in the country, should be fully utilised before public funds are devoted to sending inexperienced young men abroad. The liberal policy pursued by the Indian iron works in regard to training young Indians renders it also probable that there will be little necessity to send students abroad to acquire a practical knowledge of the metallurgy of iron and steel.

Further, as will be seen in the subsequent portion of this chapter, we contemplate the establishment of much greater facilities for technical education and technological training than have hitherto existed, and, when these have been created, they should, while providing much of the teaching at present only to be obtained abroad, produce also a much greater number of really qualified candidates for scholarships for foreign study. In our opinion, these should only be granted to men who have already committed themselves to industrial work. The new rules to some extent favour this idea, but they do not sufficiently emphasise the necessity of this limitation.

We agree with the principle that scholarships should not be awarded for industries not existing in the country, and doubt whether their grant even to persons who can 'secure the co-operation of promoters' of non-existent industries will have very useful results. We see no reason, however, why vegetable oil pressing should be excluded from the list of industries which may be studied abroad; India already possesses a number of medium sized oil mills and will soon have one or more large ones, where specialisation will be required on lines that cannot readily be learned in India.

Primary Education of Industrial Classes.

Necessity of primary education for labouring classes.

142. A factor which has tended in the past to delay the progress of Indian industrial development has been the ignorance and conservatism of the uneducated workmen. The evidence tendered by employers was almost universally in favour of labour, both skilled and unskilled, that had at least received a primary education. This is given in countries with which India will have to compete and is a *sine quâ non* in this country also. Some witnesses stated that the spread of education among the artisan classes tended to bring manual labour into contempt, and that the sons of artisans, educated beyond the primary stage, showed a distinct tendency to forsake their fathers' callings in favour of clerical work, but we think this view must be due to the wrong system of education which has been made available. We found that, while the employers of labour generally recognised the advantages of primary education among their work-people, as tending to make them not only more intelligent but also more self-respecting, yet in comparatively few instances have they made serious attempts to impart such education. There are not wanting, however, instances of enlightened employers who have provided primary and even elementary technical education. In the case of the Buckingham and Carnatic Mills in Madras this has been done on liberal and efficient lines. The industrial bias imparted by the education given there has had the result of keeping the pupils in the mills as intelligent and efficient workers, instead of leading them to desire clerical appointments, and the scheme may, therefore, legitimately be regarded as a good investment.

But we are not prepared to declare that the education of their labour is a duty of employers as such, and while we very strongly endorse the

views of employers of labour regarding the fundamental necessity for providing some form of primary education for the artisan and labouring population, we are opposed to any scheme that would compel individual employers to provide such education. This is a duty which, we think, rightly devolves on local authorities and on Government, a point which we have more fully developed in Chapter XVI, and we need only support the proposal that, when private employers undertake this task, they should be assisted in every possible way, including the allocation of grants-in-aid by the Local Governments. Although we recognise the practical difficulties in the way of finding a sufficient number of suitable teachers, we recommend that Government should consider the desirability of introducing as soon as possible into primary schools a form of teaching which will include drawing and manual training as a means of developing in the pupils a practical industrial bias.

We shall now put forward our suggestions for industrial and technical education in this country and we shall deal first with the case of cottage industries.

Cottage Industries.

History of industrial schools.

143. The spread of Christianity, especially in the south of India among the *Panchamas,* gave rise to a new class, the members of which could not be absorbed into existing cottage industries owing to the caste system, though they required a means of livelihood commensurate with the higher social status claimed by them. The great famine of 1877-78 left a large number of Indian orphan children to the care of Christian missionaries, and a few years later the first of the modern type of industrial schools was established by the late Canon Margoschis at Nazareth, in the Tinnevelly district of the Madras Presidency, to provide instruction in such trades as carpentry, blacksmith's work, weaving and tailoring, so that the boys might subsequently pass out into the world equipped with the means of earning their livelihood. The experiment was a success from the promoters' point of view, as the boys who had been trained as carpenters and blacksmiths were able to find employment in railway workshops and other organised industrial undertakings, whilst the weavers and tailors earned their livelihood by supplying the needs of the Anglo-Indian communities. The Nazareth Industrial School offered a career for orphan children and for the children of Christian converts, and it was copied in other parts of India, not only by Missions, but also in institutions started by Government, local bodies or private individuals. In places where local artisans were lacking in skill, these schools met a distinct want; but in others, they served merely to satisfy vague local aspirations towards the promotion of industrial education.

The Mission schools had, of course, their special object in view, but other schools which have followed in their wake, have not always appreciated the purposes which ordinary industrial schools should attempt to fulfil. The training they offer is of little value when it merely consists, as it usually does, in teaching ordinary bazaar methods through the

agency of *mistris* who are paid much smaller wages than a good workman can earn. Something very different is wanted, and this can only be supplied by a head master or superintendent, who possesses not only a thorough practical knowledge of modern methods of handicraft and specialised experience in certain branches, but also the capacity to apply general principles to particular cases. Such a man can teach students to produce much better work than that of the bazaar worker with less expenditure of time and energy. Striking examples of the results of such teaching were seen by us in the case of several of the better-managed industrial schools. Men of the type required, it is true, are rarely to be found in the country and require relatively high pay. A solution of the difficulty seems possible on the lines adopted in the Central Provinces, where the head master of the School of Handicrafts at Nagpur is being placed in general control of similar schools, the superior staffs of which are selected and in some cases trained by him. Teachers for these schools can often be recruited from ex-pupils.

Recommendations of the Commission.

144. Industrial schools generally have failed to observe the distinctions which exist between industries, on the one hand, such as weaving and certain branches of metal work which come into competition with organised industries, and, on the other hand, trades like those of the carpenter and blacksmith which are still, in the main, carried on as handicrafts, even in organised workshops. Though as a rule the products of hand-loom weaving are of a different class from those of the power loom, the hand-loom weaver directly competes with the power-loom weaver, and his success or failure depends in the first instance upon the right selection of the appliances which he uses, even more than upon the degree of skill which he acquires in working them. It is a comparatively simple matter to train an intelligent hand weaver to use improved appliances, whereby his output will be greatly increased. The problem is to find an outlet for his increased production, and efforts to improve the lot of the hand-loom weaver must end in failure, unless attention is concentrated to a much larger extent than has hitherto been usual on commercial questions, which involve the purchase of new materials, the selection of suitable designs and patterns and the establishment of commercial agencies for the disposal of goods. Our more detailed proposals regarding this type of organisation will be found in Chapter XVII.

On the other hand, in schools of handicrafts, the first essential is that the pupil should by degrees acquire a thorough knowledge of the craft and manual dexterity in carrying out its processes. The tools used are neither automatic nor semi-automatic in their action and the quality of the work turned out depends entirely upon the personal skill of the workman. The training is best given by a graduated series of exercises, and the best results can be obtained by an almost total neglect of commercial considerations, so far as they affect the disposal of the product. At this stage the quality of the work is of more importance than the quantity, and it is only when skill has been acquired that attention should be concentrated on productive capacity. The craftsman who makes his living

as a cottage worker requires a different and somewhat more elastic training than the craftsman who becomes a unit in an organised industry. In the latter case more specialisation is usually needed, and the man will have to work under conditions very different from those which can be obtained in a school of handicrafts, where it is difficult to maintain the discipline of a workshop or to attach great importance to what may be termed commercial considerations.

The industrial school is, at best, a defective instrument of education owing to the non-commercial conditions under which it must necessarily be carried on. In spite of this, it seems to be the only means by which the indigenous artisan can be trained; though, in the past, through his ignorance and lack of education, and through the imperfections of their equipment and teaching staff, industrial schools have failed in the majority of cases to achieve any appreciable results. While, therefore, they are institutions to be encouraged and developed within the limits just specified, we regard them as altogether unsatisfactory, if employed to train artisans for organised industries.

Control of industrial schools.

145. In the Madras Presidency, the industrial schools are under the control and inspection of the Director of Industries. In the United Provinces, the schools are still attached to the Education Department, but are inspected by the Director of Industries who practically controls them. In the Central Provinces, the only school visited by us was under the Department of Agriculture and Industries. In Bengal, Bombay and elsewhere, the Education Department still controls industrial education. In some cases special inspectors have been appointed. The absence of any direct means of keeping the schools in touch with the cottage industries of the districts in which they are situated is very noticeable. The remedy obviously lies in the transfer of the control of industrial schools from the Department of Education to that of Industries. Our general views on the important question of the control of industrial and technical education will be found at the end of this chapter (paragraphs 177-179).

Organised Industries.

General principles affecting the training of men for organised industries.

146. We shall now put forward our recommendations for the training of men for organised industries. We shall discuss more particularly the training of the supervisor class, in view of the fact that under present conditions there is a far greater lack of Indians qualified for such positions than of Indian artisans and operatives. Though it is true that the supply of these latter is generally insufficient and that their skill and intelligence require improvement, the main remedy needed is the provision of an incentive to excel, which can be given only through a general improvement in their conditions of life. We shall, however, in setting forth our scheme for engineering training, suggest a system of training engineering artisans, which can be applied, as opportunity offers, to the case of other large-scale industries.

Before framing our proposals, we find it necessary to point out in what ways the various industries differ, from the point of view of the training which will be required by the persons who will engage in them as supervisors. We may explain, in the first place, that the method of recruitment in force in England, where industries have gradually grown up by natural evolution, is not yet possible everywhere in India. The supervising staff in a large number of English industries is recruited entirely from one or other of two sources—from artisans who have worked their way up, obtaining the necessary theoretical knowledge by private study or in evening classes; or from young men who have some connection with the industry and have taken a course of special teaching, followed by or combined with practical training in the factory. It is very exceptional for a person unconnected with the industry to attempt to enter it. We believe that circumstances are not the same in certain other countries with equally advanced industrial organisations; that these possess a more complete equipment for practical and theoretical training outside the factory, and that persons with no previous association with the industry are frequently admitted into it after passing through training institutions. In the case of engineering, on the other hand, it is common in England for pupils and apprentices to enter the shops without previous connection with the industry. When we come to discuss the various forms of technical training required in this country, we are faced with the fact that there are very few industries which can completely, or even nearly completely, supply from the ranks of the workmen or of the educated classes connected with the industry the recruits wanted for the control of existing or future undertakings. The former are at present too uneducated to rise; the latter are to a large extent non-Indians, and are in any case few in numbers. We shall therefore require special arrangements to supply candidates for supervising posts with the practical training in the factory which, in the case of so many industries in England, is obtained almost automatically.

We must remember, in the first place, that successful supervision implies a knowledge of business, including such questions as the control of labour, and these can only be learned by actual experience. In the next place, they require that a man should, especially in the earlier stages of commercial employment, submit to long hours and hard conditions. In some cases, he can accustom himself to these during the period of training, and, wherever possible, he should be compelled to do so.

Classification of industries for purposes of training.

147. From the point of view of the actual training, we may divide industries into two classes:—(1) those in which long practical experience is necessary for the supervisor to estimate the working conditions and judge whether the quality and output of the work is satisfactory; and (2) those where, on account of the automatic or semi-automatic character of the plant, or of the simplicity of the processes, the necessary knowledge can be more quickly acquired. As instances of the first class, we would refer to such branches of mechanical engineering as repair work or the making of machinery; the manufacture of pottery

and glassware; textile work; tanning; and mining. We shall call these manipulative industries. The manufacture of sugar and chemicals, and oil and rice milling are examples of the second, which we shall entitle non-manipulative or operative. The first class of industries usually require a training in industrial concerns; but, in some cases, *e.g.*, textile work, they are carried on under conditions which make it difficult for the learner to acquire the necessary knowledge in the works themselves, and they can be learned more easily in instructional factories attached to schools. In this latter case, it must be remembered that practical training given in a school does not offer the student the opportunity of accustoming himself to mill conditions and of acquiring experience of mill management; though the greater facilities for learning more than compensate for this, these deficiencies must be made up for later. In the case of the second class of industries, the only training that can be given is mainly technological, consisting, for instance, of a course in industrial chemistry of a special type, together with some training in the handling of machinery and in the making of drawings. The student will require practical experience, but, from the nature of these industries, this need not be acquired at a very early stage in his career. A sugar-works manager or chemical manufacturer usually starts with a training in technological chemistry, and a less complete training, which he can acquire in a teaching institution, in mechanical engineering. He then goes as a chemist to a sugar factory or chemical works, and gradually familiarises himself with the general work of the factory, till he is qualified for more responsible posts. He neither requires, nor as a rule obtains, any special manipulative skill. A master-tanner's training is also very largely in a special branch of applied chemistry; but he requires some degree of practical experience of the industry, especially in the currier's shop. But we must again emphasise the fact, that actual works experience must be obtained at some stage or other in the student's career, and this can only be given in a factory working under commercial conditions. A man who is acquiring a knowledge of factory management in a chemical works, a sugar mill, or a brewery may also be earning his living as a works chemist; but that does not affect the principle. We desire further to point out that in manipulative industries carried out on a comparatively small scale, as is mostly the case in India at present with tanneries, potteries, and glass works, it is impossible to provide what we consider the ideal form of education, *i.e.*, the properly controlled training of apprentices in the works, with theoretical classes attached. The small-scale glass works, which exist in India at present, produce only a limited range of inferior articles; a large modern glass works could not only provide for the systematic training of apprentices for all kinds of glass making and furnish the most effective basis possible for the future recruitment of the industry, but would also be in a far better position to resist foreign competition. The engineering industry is, fortunately, on a different footing. But for most other manipulative industries, the only way in which practical training can at present be provided is by means of a small factory run on non-commercial lines—a method which is exceedingly costly. It may be necessary in certain

special cases to have recourse to it, but it is vastly inferior to the systematised training which can be given to groups of apprentices in large works with provision for theoretical courses alongside.

Different classes of training required.

148. We have, therefore, to provide for the following classes of higher industrial training :—

(1) Training for manipulative industries in works large enough to employ a number of apprentices, for whom theoretical teaching can be provided in class-rooms attached to the works.

(2) Training, in certain special cases, for manipulative industries in technical schools, with workshops or instructional factories attached. This method would be adopted in cases where there were no works available on a large enough scale, or where, as in the case of the textile industries, the necessary technical knowledge can be much more easily imparted outside the mill. The extent of the equipment required for practical work would depend on the degree to which manipulative knowledge is required in the industry. This training must be followed by a period spent in a commercial factory, probably on a very low salary or as a pupil.

(3) Technological training for non-manipulative industries, which would be given in a teaching institution, where a student would take courses in some special branch of technological chemistry, coupled with training in such subjects as mechanical or electrical engineering, which the particular branch of technology selected by the student may indicate as necessary. Such a course of training will often of itself create a wage-earner ; but further experience is needed if the student wishes to rise in his profession.

The distinctions laid down above must not be considered as entirely rigid. There will be cases on the border line, which may be dealt with in one class or another, as local or personal convenience may determine. It will be possible also in the case of class (2) to group together in one teaching institution the training or some part of the training required for industries practised on a small scale.

In framing our proposals for a system of industrial training, therefore, we shall deal first with training in mechanical engineering, which is the most important need at present for India's development, and for which, fortunately, the facilities are considerable. We shall treat this question in all its aspects, including therein our proposals for the training of artisans and foremen, as well as of engineers. We make no specific proposals in this chapter for establishing the instructional factories to which we have alluded, although remarks will be found on this subject in Chapter XIV. But the advisability of providing this form of training in the

case of any particular industry or province will depend on local circumstances, and it will be for Departments of Industries to decide each case on its merits. We shall put forward our suggestions for training in technological chemistry, which we propose should be given in certain existing collegiate institutions. These, as at present constituted, are mainly concerned with training engineers and include facilities for a grounding in mechanical engineering, which will be sufficient for men of the class we have in view. We shall next explain our conclusions regarding the Victoria Jubilee Technical Institute, Bombay, which provides both technological and technical training; and then, after putting forward our views on mining and metallurgical teaching, we shall discuss the measures required for the control and co-ordination of the various forms of industrial, technical and technological training, and for bringing our training institutions into touch with employers of labour.

Training of artisans.

149. We may now discuss the question of the instruction of artisans for mechanical engineering. Looking forward as we do to a very great industrial expansion in the immediate future, we think that the present arrangements for the training of artisans are totally inadequate, and that it is essential that steps should be taken as early as possible to provide a much better training for many more boys. We were much impressed by the great possibilities for training in mechanical engineering in the numerous large railway workshops, which are so distributed as to form convenient centres in almost every major province of India. Private engineering establishments on a large scale, though confined to a few important cities, are also suitable for the same purpose. But the system for the apprenticeship of artisans pursued in these shops is at present rudimentary. The sons of employés are taken on at the request of their fathers and turned into the shops to pick up a knowledge of the trade as best they can. They are paid small wages to begin with, and the amount is gradually increased as they grow older and more useful. There is no regular apprenticeship, and not infrequently the boys are tempted to leave long before they ought, by the offer of slightly higher wages outside. We point out elsewhere the risk of boys, who have received a little education, leaving their hereditary manual occupations for small clerical posts. The only remedy is to improve the social status and prospects of the skilled artisan. Though such a proposal has been supported by numerous witnesses, we are opposed to any legislation designed to penalise the employment of indentured apprentices by third parties; and would leave the system of indenture on the same contractual basis as at present. We think, however, that much can be done to counteract the tendency among promising youths of the working classes to seek clerical occupation, by a more liberal treatment in respect of wages, the provision of opportunities for further education, and the institution of a better form of agreement. From the time a boy enters a workshop to learn a trade, he should be paid wages at least equivalent to what he would otherwise earn in the bazaar; from which, in order to secure his regular attendance and to provide

inducements to him to go through a complete course of training, there should be placed to his credit every month a certain amount of deferred pay ; and this, under the initial agreement, should only be due to him on the completion of a specified period of service, which should usually be about five years. Night schools have proved less successful in India than elsewhere, and even in England they are tending to fall out of favour. It should be recognised that, when a boy has done a fair eight hours' work in the shops, he is not fit to profit by class instruction. Every apprentice, therefore, should be given within the shop hours elementary technical education suited to the trade that he is learning, and he should be taught drawing and mensuration, so that he may at least be able to understand a plan and work from it. In large engineering establishments where the number of apprentices justifies the expense, there should be a special officer to supervise them and see that in each shop they are properly employed. Supervision of this sort is still more necessary in the case of apprentices and pupils under training for posts of foremen and engineer officers, regarding whom we have made proposals in the following paragraphs. In some instances, the more intelligent and ambitious apprentices will certainly desire to acquire a working knowledge of English, which will enable them to communicate more freely with their superior officers and will give them access to sources of information denied to workmen unable to read and write that language. It is only for teaching of this kind, when there is a demand for it and it cannot be provided by other means, that evening classes should be accepted as a method of imparting instruction to apprentices.

The system which we have proposed above provides for the attachment of teaching classes to a single large shop. There may, however, be cases where works, none of which is large enough in itself to form the basis of an educational unit, exist sufficiently close together to form a group ; and here, we think, teaching classes may be provided in a common school conveniently situated for apprentices attending the different works, and controlled by a committee on which the Department of Industries and the various employers may be represented. We think that this system might, when necessary, be extended to meet the case of apprentice foremen and engineers.

Raising the status of artisans.

150. We received many complaints regarding the unsteadiness and inefficiency of Indian labour, defects which, so far as they arise from a low standard of comfort, we have dealt with more fully in Chapter XVI. It is doubtful if sufficient inducements in the way of pay are yet held out to men to become really first-class artisans. To reduce the difference between the pay of the skilled workman and the foreman and so lessen the cost of supervision, it is necessary greatly to improve not only the skill, but also the prospects of the workman, and teach him to regard himself as a member of a skilled and respected body. Any means of raising the self-respect and social status of the artisan will benefit, in the long run, the employer no less than the employed.

151. Above the skilled workman is the *maistry*, or foreman, and the provision for training such men is hopelessly insufficient. We were forcibly struck, when visiting the large railway and private workshops throughout India, with the almost complete absence of Indians from the ranks of foremen and chargemen—the non-commissioned officers of the great army of engineering artisans. At present these posts are filled almost entirely by men imported from abroad. The railway companies are endeavouring to supply this deficiency by training European and Anglo-Indian youths, the sons of their own employés as a rule, and with fair prospects of success. The effect on industries generally of the absence of men of this type is clear from opinions which have been expressed to us regarding the comparatively low state of efficiency of the plant in many factories which do not employ a high proportion of imported men on their subordinate staff. The continuance of conditions which force the industrialists of the country to import so many of their subordinate supervising staff is clearly most undesirable. They form a serious handicap to progress and militate against the ideal of an industrially self-sufficing India. Many men brought from foreign countries are found unsuitable on their arrival here; others take a dislike to the country or develope indifferent health, and are generally a source of anxiety to those responsible for bringing them out. It is common knowledge that no small proportion of the men so imported have to be repatriated at great expense to their employers. Mechanics, as a class, are unwilling to leave their home countries to accept service in India, and the prospect is rather remote of suitable men being available for the new industries which we hope to see started. To meet this most pressing need, every effort should be made to create a class of Indian foremen and chargemen. A difficulty arises in this country from the fact that the educational attainments of the artisans are too low to fit them for such posts, while the stipends and the prospects offered are not of a nature to induce the better educated classes to spend a number of years as workmen, though this is the only way for them to acquire the practical experience which is essential, if they are to be in immediate charge of specialised sections of a workshop or factory. The attempts at compromise, which are now under trial in several technical institutes and schools, are not likely to meet with success, even when, as in some cases, the course of instruction is followed up by a few months in a factory or engineering works. Instructional courses do not familiarise the students with practical shop conditions, with their long hours and strenuous life and the demands which they make on the resourcefulness and intelligence of the supervising staff, nor do they enable them to discover whether such a life is one which they are physically able to stand or care to accept as a permanent occupation. Further, the students look on their few months' training under shop conditions as a test to be passed and put behind them, rather than as an earnest of the employment awaiting them after training, and the arrangements for the training of students in the shops do not, it would seem, really bring them into

The training of foremen: existing arrangements.

close contact with the principles underlying commercial engineering work. These defects have been recognised to some extent, and attempts to remedy them are now being worked out in the engineering schools at Lucknow, Bankipore and Nagpur. In these schools, the idea is to give an all-round training in the various engineering trades, simultaneously with instruction in drawing and in the elementary principles of science which find application in mechanical engineering. After a course of this kind extending over a period of three years, the pupils are drafted into the mechanical workshops, where it is intended that they should specialise in some particular department, in the hope that, if they apply themselves diligently to the acquisition of practical experience, they will in a few years become capable of being entrusted with supervisory work. These attempts to combine teaching with workshop practice are not, however, in accord with the idea supported by the balance of opinion among mechanical engineers all over the world, that the technical school courses should not precede workshop training. It is important to remember that theoretical training is doubly valuable when given to a student who has in his mind a definite picture of the conditions under which it will be applied. The result of our enquiries convinces us that the same system is equally suitable under Indian conditions, and we describe in the next paragraph the lines on which it should be worked.

The training of foremen: proposals of the Commission.

152. Railway workshops are, as we have stated, in many cases already receiving European and Anglo-Indian apprentices, to whom some degree of technical training is given with the object of enabling them to obtain posts as foremen, or, in special cases, even higher appointments. There is, however, a noteworthy absence of provision for the middle-class Indian. We consider it of great importance that the conditions of training should be such as the educated Indian youth will consider consistent with his sense of self-respect; for if this is not satisfied, we shall be depriving ourselves of a most promising field of recruitment. The arrangements made for Indian apprentices are at present inadequate; and the stipends paid them during the period of training and the salaries offered on its completion are very much lower than the corresponding amounts in the case of Europeans and Anglo-Indians, a fact which is largely responsible for the failure of the better educated Indians to take advantage of these courses. As regards salaries, we consider that the principle must be adhered to that equal proficiency should be equally remunerated. The inequality of stipends is to some extent justified by the difference in the standard of living between Europeans and Anglo-Indians on the one hand and some classes of Indians on the other, though the stipends at present offered to Indians assume too low a cost of living to meet the case of the educated middle classes. We think the difficulty might be got over by allowing free board and lodging to all Europeans and Anglo-Indians, and to such Indians as prefer it. To other Indians, a stipend to cover board expenses based on the standard of living of the middle classes should be given. Apprentices of all kinds should receive a monthly

sum over and above the expenses of their board and lodging, depending on the length of time they have worked and on their efficiency in the shops. We consider that every effort should be made to develope the training facilities existing in these shops, grants being given from Government funds for the establishment of technical classes, together with hostel accommodation and such other amenities as are necessary to attract educated Indian youths of the middle class. The precise allotment between Government and the Railways of the extra expenditure entailed will require further consideration. With the technical school alongside the workshop, it becomes possible to provide an almost ideal course of training. Almost equal possibilities for training can be made available in a few of the larger private workshops, and we do not doubt that the managements of these would welcome the provision of similar arrangements for the technical training of their employés. In discussing the question of training industrial artisans, we have suggested the adoption of an apprenticeship system, and we think that a precisely similar system should apply to the more advanced class of students with which we are now dealing. The regulations for the admission of apprentices and for the working of the system generally should secure the admission of a proper proportion of Indians and the fair and equal treatment of all classes in their course of training, while upholding the authority of the workshops management to the fullest extent. The indentures should be for a period of four or five years, and, as we have said already, the apprentices should be paid wages. Apprentices of this class should start work usually between 16 and 18 years of age. If they enter the workshops at too early an age, their physique will be insufficiently developed to stand the stress and their previous opportunities for obtaining the necessary education will be unduly restricted.

An example of a scheme of this type, worked out by officers of the East Indian Railway Company, will be found as Appendix N.

The Training of Mechanical Engineers.

Public Works Department colleges and schools : Roorkee.

153. There are four engineering colleges in India which provide the training required by recruits for the Public Works Department. The largest is at Roorkee in the United Provinces, where it was originally established in 1847 to train the engineers and upper subordinates who were required in rapidly increasing numbers on the extensive system of public works, and particularly the irrigation canals, that were started soon after the province came under British rule.

Madras.

At an even earlier date (1794) a school for surveyors was started in Madras which ultimately developed into an engineering college in 1857. Thirty years later it underwent extensive reorganisation and its staff was greatly

strengthened. Little, if any differentiation is made between the training given to civil and to mechanical engineers. Quite recently, an electrical course has been instituted and a Professor of Electrical Engineering added to the staff.

Sibpur. The Sibpur Engineering College developed from University courses in engineering, which were started in 1858 by the Public Works Department and handed over in 1860 to the Presidency College. In 1880 this engineering branch was constituted a separate college and transferred to Sibpur where it has since remained. The growth of modern industries in Bengal has greatly influenced its development, and the courses of instruction now provided are of a more general character than would be essential, if only the requirements of the Public Works Department had to be met.

Poona. The College of Engineering, Poona, started in 1854 as the Poona Engineering class and Mechanical School. In 1866 it was affiliated to the University of Bombay and styled the Poona Civil Engineering College. Later, in 1879, classes in agriculture and forestry were added, and in 1880 the name was changed to "The College of Science." In 1907 the agriculture classes were removed; in 1911 the courses leading to the degree of B.Sc. were transferred to the new science institute in Bombay, and the name was again changed to that which it now bears. At the present time the courses of instruction lead up to the University examinations for the degree of B.E. (Civil) and B.E. (Mechanical). There are also classes for Public Works Department sub-overseers, mechanical apprentices and electrical apprentices.

There are also a number of less important schools of engineering training chiefly for the Public Works Department, but including in their courses some instruction in mechanical engineering.

Defects of Indian system of training engineers. 154. In the past, the education of engineers has been too much influenced by the immediate requirements of the Public Works Department, without regard to the future or to those other interests in India which can be handled only by engineers. The higher branches of the engineering services in this country absorb but a very small proportion of the engineering students who pass through the colleges, and the rest enter the upper subordinate ranks or find private employment of a not very remunerative character. The greater part of the work done in each college is the training of upper subordinates, lower subordinates, surveyors and draftsmen. Students join the college classes in the hope of getting appointments as Assistant Engineers; but, failing these, they consider that they have a better chance as upper subordinates, if they have passed out of the colleges as engineer students and not as upper subordinate students.

In the four principal colleges, increasing attention has in recent years, been paid to the provision of instruction in mechanical and electrical

engineering; but the measures adopted are inadequate and are conceived on altogether too narrow lines to meet the needs, present and prospective, of a rapidly expanding industrial system. Indian civil engineers have done well in the Public Works Department and have established their claims to promotion to the highest ranks of the service; but in mechanical engineering which, outside the railway workshops, is mainly carried on by private enterprise, we find that, in the absence of a proper system of training, they have seldom attained to positions of importance or responsibility. In practically all the engineering workshops which we have visited, we found the same state of affairs existing with regard to the superior staff as we had seen in the case of foremen. The former, whether assistants or managers, were men who had been trained as mechanical engineers in Great Britain.

It is only in recent years that the Government engineering colleges have recognised that they ought to be something more than mere appanages of the Public Works Department; but so far, the attempts made to train students for careers other than those offered by service under Government, District Boards or Municipalities, have taken the form of alternative or additional courses of instruction, and until quite recently no radical reforms have been contemplated, much less introduced.

Necessity of providing for industrial developments.

155. Especially since the outbreak of war, various causes have attracted public attention in an increasing degree to the predominant importance which mechanical engineering is now beginning to assume in this country. The establishment of the manufacture of steel on firm basis of commercial success brought into sight the possibility of further developments on a scale never before contemplated. It has not only encouraged English firms to consider the formation of branches of their own specialised industries in India after the war, but has given opportunities to Indian capitalists to take in hand schemes for various forms of engineering and metal manufacturing work. The production of zinc and copper from Indian ores has recently come within measurable distance of actual accomplishment, and has still further increased the scope of possible enterprise. The experience of the war itself has been responsible for a new attitude on the part both of Government and of leading industrialists. They realise that it is necessary to create in India the manufactures that are indispensable for industrial self-sufficiency and for national defence, and that it is no longer possible to rely on free importation of essential articles in time of war. We think it not out of place to observe here that the existence of this Commission and the discussions which have from time to time arisen out of the evidence given before it, together with the creation of the Munitions Board, itself a development of the Commission, have helped in the above direction. Finally, the attention of the educated public, and in particular of the large industrial employers, has been drawn to the inconveniences and dangers that arise from the entire dependence of India on imported personnel for the supervision of engineering industries.

156. The education and training of engineers was the subject of an enquiry by a committee appointed by the Council of the Institution of Civil Engineers in 1903, on which committee all the important engineering societies were represented. Their report, which was published in 1905, embodies the collective experience of engineers belonging to practically every branch of the profession, and though in many respects the conditions in India are different from those prevailing in the United Kingdom, certain fundamental conclusions were reached which are entirely supported by the facts placed before us in evidence by leading engineers and industrial employers, and should be adopted in this country. In submitting their recommendations, the committee prefaced them by the statement that they were unanimous in their opinion that engineering training must include several years of practical work as well as a proper academic training. They considered :—

System recommended in England for training mechanical engineers.

"(1) That the average boy should leave school when he is about 17 years of age; that much depends upon the development of individual boys, but the minimum age should be 16 and the maximum 18 years.

(2) That the practical training should be divided into two parts, and that the preliminary stage of practical training should consist in all cases of at least a year spent in mechanical engineering workshops.

(3) That during workshop training, boys should keep regular working hours and should be treated as ordinary apprentices, be subject to discipline and be paid wages.

(4) That nothing should be done in the form of evening study which would impose unnecessary strain upon the boys.

(5) That, as a rule, it is preferable to proceed to a technical college on the completion of the introductory workshop course; but that, in the case of boys intended to become mechanical engineers, it may be advantageous to complete the practical training before entering the college; but in such cases it becomes important that simultaneous education during practical training should be secured. Otherwise, the boys would lose seriously during four or five years' suspension of systematic study, and would be at a disadvantage on entering the college.

(6) That for the average student, the period of college study should be at least three years.

(7) That at least three to four years should be spent in practical training, inclusive of the introductory workshop course previously mentioned."

157. We are aware that this question has been discussed on other occasions, at times with the same, at others with somewhat different, results; but a study of these discussions has led us to the belief that the above-quoted conclusions may fairly be taken not only as the most authoritative expression of British engineering opinion at the time, but as still representing the general views of the profession. The methods pursued in this country, however, differ widely from the system suggested above. The age of boys when they join an engineering college in India is from two to three years higher than that recommended. Most, if not all, of the colleges prescribe a period of training in workshops after the completion of the theoretical courses, just as we have seen in the case of institutions giving a lower type of training; but even this period is much too short to be of practical value to mechanical engineers; no attempt is made to subject the students to regular workshop discipline, and they are not compelled to attend the full working hours. They go

from shop to shop making notes and sketches, and watch others at work, but, as a rule, do nothing themselves. This course, such as it is, broadens the outlook of students who are intending to become civil engineers; but it is worse than useless as an initiation into the mechanical side of the engineering profession.

It has been objected that educated Indians will be unwilling to submit to the early hours and hard conditions of workshop training. This may, no doubt have, been the case in the past, but there are now numerous signs of a marked change in sentiment, and we feel confident that, if facilities are provided, increasing use will be made of them. There are difficulties in the way, we admit; but they are not so great as is often supposed, and can be overcome.

Proposals of the Commission for training mechanical engineers.

158. There is, thus, as we have seen, a very decided consensus of opinion among practical men that the ideal method of training mechanical engineers is to combine workshop practice and technical instruction as closely as possible. To attain this end in India the workshop has been imported into the college, but the results have not been altogether satisfactory. The atmosphere of the workshop cannot be obtained in the school, and the importance of this is so great that we are convinced that mechanical engineers must be trained in the workshops, receiving supplementary class instruction in technical schools alongside, which should, of course, be of a more advanced nature than that which would be provided for foremen. That is to say, the mechanical engineer, by which term we mean the man who in after-life will be responsible for the design and construction of machinery and structural iron work of every kind, should be trained in a way analogous to that prescribed for the members of the labouring classes who will become artisans, and the boys of a higher social grade and with a better general education who aspire to become foremen; but he should start in the workshop somewhat older and after a more prolonged general education. In the factory, he should be regarded as a workman and treated as such, and paid wages which should represent the market value of the work he does; but he should not spend the whole of his time in the workshops. Roughly, the time spent in the technical classes should be equal to one-third of the total working hours of the shops, but whether this be so many hours a day or so many days a week matters little and may be arranged to suit local circumstances. The main idea underlying our conception of the proper method of training mechanical engineers is thus a fundamental modification of the current practice in India; the chief training-ground should be the workshop, though the class-room is also indispensable.

Further training of mechanical engineers in special subjects.

159. After the period of apprenticeship is completed, and this should not be less than four years and may usually with advantage be five, those apprentices who desire to specialise should be provided for in one or more of the existing engineering colleges, where advanced courses of instruction will be given in such

subjects as applied mechanics, electrical engineering, the physical sciences, hydraulics, the strength and properties of materials, and heat engines. It should be recognised that these students are adults seeking to gain knowledge for a very special purpose, and they should not be treated as undergraduates and forced to go through a rigidly prescribed course of instruction, such as is now provided in the engineering colleges of University rank. Our general idea is that colleges of this status should be made accessible to advanced students who wish to take special, instead of complete, University degree courses.

We have not specifically referred to the training of electrical engineers because electrical manufactures have not yet been started in India, and there is only scope for the employment of men to do simple repair work, to take charge of the running of electrical machinery, and to manage and control hydro-electric and steam-operated stations. The men required for these three classes of work will be provided by the foregoing proposals for the training of the various grades required in mechanical engineering. They will have to acquire, in addition, special experience in electrical matters, but, till this branch of engineering is developed on the constructional side and the manufacture of electrical machinery taken in hand, the managers of electrical undertakings must train their own men, making such use as they can of the special facilities offered for instruction at the engineering colleges and the Indian Institute of Science.

Technological Training.

Expansion of engineering colleges into technological institutes.

160. It will be necessary in the immediate future for Government to consider the more general question of the part to be played by the existing engineering colleges and the Universities, in providing for the increasing need in India for scientific, technical and technological training. We feel convinced that, as the development of the country proceeds, the number of students will increase and that, in consequence, at no distant date it will be found desirable to abolish the school departments of these colleges and to make provision for the education of subordinates in separate institutions, which, not being of University rank, will be placed under the control of the Directors of Industries. It is urgently necessary to prepare for a higher technological training, which will provide the means whereby the physical science students of the colleges affiliated to the Universities may learn to apply their knowledge to industrial uses. The simplest way of meeting this demand would be to expand the engineering colleges into technological institutes by the creation of new departments. At present they are chiefly occupied with the training of civil engineers. We have just recommended that they should make provision for the higher technical instruction of mechanical and electrical engineers, and we anticipate that industrial expansion will justify the starting of departments of general technological chemistry, which, in each college and teaching University will specialise to the extent necessary to meet at any rate the more pro-

minent local needs. We regard it as certain that public opinion will demand that these colleges shall be connected with the local Universities and that the students shall be able to obtain University degrees. To this we think no serious objection can be raised, provided that the terms of association leave the colleges free to frame their own courses of study, reserving to the Senates of the Universities the right to prescribe which shall be selected as qualifying a student to enter for a University degree. The internal administration of the colleges should be controlled by a Board or Council, the members of which might be nominated by the Department of Industries, the University, and public bodies representing employers. This Council should have the privilege of delegating a certain number of its members to represent it on the Senate.

Imperial engineering colleges foreshadowed.

161. Up to this point our recommendations regarding industrial and technical education are such as should be carried out by provincial Governments; but, we think, it will be necessary ultimately, if not in the immediate future, to provide India with educational institutions of a more advanced character, which no single province could support or fill with students, yet which each province will need to a greater or less extent. For some time to come the demand for this higher training can best be met by the provision of scholarships to enable students to proceed abroad, but, as soon as our foregoing recommendations have had time to develope their full effect, it would be advisable to proceed further and establish imperial colleges of the very highest grade. Two at least would be needed, staffed with specialists of high reputation who must be provided with adequate equipment for both teaching and research work. One of these colleges should cover every branch of engineering, while the other should be devoted mainly to metallurgy and mineral technology, the developments of which are certain to be on a very extensive scale. Provincial colleges can only hope to secure the services of good, all-round men who would be employed mainly in teaching work; but, if the ideal of a self-sufficing India is to be completely carried out, specialisation must be provided for, and this can only be achieved in colleges with a large number of advanced students. We can hardly hope to serve any useful purpose by pursuing this idea further. Details will depend upon the actual state of things at the time when it becomes necessary to mature a scheme. We, therefore, refrain from elaborating any proposals of this nature and content ourselves with suggesting that they should always be kept in sight as the goal.

Scientific and technical societies.

162. Before leaving the question of higher training we desire to advert to one important matter. We consider that India suffers from the general absence of organisations similar to the great scientific and technical societies which have in many countries done so much to promote the professional education of their younger members. We have already

had occasion to refer to an instance of the work of the English Institution of Civil Engineers in this direction, and we think that it would be greatly to the advantage of Indian engineers if a representative society were started. Our views on the subject, which we regard as one essentially for private initiation, are explained in detail in Appendix H, and here we need only add that we in no sense limit our suggestion to engineering. Whenever the number of specialists in any branch of science or professional activity is sufficient to enable them to form an association to promote its development in India, their action in this respect should be supported in every reasonable way by the State.

The Victoria Jubilee Technical Institute, Bombay.

Proposed utilisation of engineering classes to supplement workshop training.

163. Reference has already been made to the starting of the Victoria Jubilee Technical Institute in Bombay. During recent years it has developed a somewhat polytechnic character, and now provides courses of instruction in (1) mechanical engineering, (2) electrical engineering, (3) textile manufactures, (4) applied chemistry, and (5) plumbing and sanitary engineering. Most of the witnesses who have come before us with experience as employers of its students have spoken well of them ; but, so far as the training in mechanical engineering is concerned, ex-students are nearly all employed in subordinate capacities, and there is little probability that many of them will rise to high positions. The courses of instruction extend over four years, of which the last six months have to be spent on practical work. Enquiries made of the managers of workshops and factories in which these students received this part of their training did not convince us that the arrangements were of a satisfactory character. Moreover, the time allowed for practical training is too short. In view of the conclusions we have reached regarding the training of mechanical engineers, we cannot regard the work done in the Institute for this class of students as satisfactory. Instead, however, of abolishing these classes, it would be preferable for the Institute to associate itself more closely with the local engineering industries carried on in Bombay ; and it should not be difficult to frame a scheme whereby the Institute, in its new location at Matunga, will supplement the workshop training of apprentices from the railway and other workshops, thus performing locally the function of the technical classes which we have recommended in the case of the larger workshops. To a large extent, the popularity of the mechanical engineering classes is due to the law which prevails in certain provinces compelling owners of steam plants to place their boilers in charge of certificated men. If the suggestion which we make elsewhere that this law should be abolished is carried into effect, there will be undoubtedly less demand for instruction of the kind necessary to pass the specified Government examination. On the other hand, we hope that the forthcoming expansion of mechanical engineering will more than replace the loss of this

artificial demand for what can only be described as a very imperfect training.

Technological courses: two years practical course recommended.

164. These remarks do not apply to the technological courses which include (1) textile manufactures, (2) applied chemistry, and (3) plumbing and sanitary engineering. In these instances, we approve of the existing arrangements whereby the students receive a preliminary training before embarking upon practical work. In this view we are largely influenced by the fact that the classes are conducted throughout on lines as nearly resembling actual commercial practice as is possible in any teaching institution.

The spinning mill or the weaving shed is not an appropriate place in which to give instruction in textile mechanism, and practice in the working of the machines can be more easily arranged in a specially-equipped shed, where a great variety of single units is available. Knowledge and experience of this kind can be gained much more rapidly in the Institute than under practical working conditions in a mill, and there is no doubt that the young man who aspires to become a textile manufacturer, can best begin by going through one or both of the specialised courses of instruction provided by the Institute. Similarly a preliminary knowledge of chemistry is essential to any one who intends to apply such knowledge to manufacturing processes, and the laboratory rather than the chemical works is the place in which the training should begin.

In regard to plumbing and sanitary engineering, most of the practical work consists of fitting up buildings in accordance with prepared plans, and before a young man can be sent out to do such work, he requires considerable skill in manipulating the materials employed, and some general knowledge of the sciences which bear upon sanitary engineering. It is also necessary that he should be able to prepare plans and estimates, and, without doubt, a knowledge of these matters and the requisite degree of craftsmanship can be attained most readily in organised schools.

165. We therefore consider that in respect of these technological courses, no changes are necessary; but we think that the training in the Institute should be followed by two years spent on practical work, before the full diploma can be obtained. The students should be apprenticed on leaving the Institute, and they should be given definite employment and paid a living wage. There will, no doubt, be difficulty at first in finding places for them. Employers of labour in this country have realised only to a limited extent that it is incumbent upon them to provide facilities for training the rising generation. To convince them propaganda work will, at the outset, be necessary. There are fortunately many Government workshops to set an example, and it should not be difficult to induce the owners and managers of private undertakings to follow suit.

Mining and Metallurgical Education.

166. Mining education in India occupies, as we shall explain below, a somewhat peculiar position. Two systems of teaching, applied to very similar material, are going on side by side, and there is a large concentration of mining employment on a single area—the principal coal field—while other forms of mining are scattered over the whole of India, and differ widely in character. For these reasons we have thought it necessary to discuss the subject in detail.

Mining education : existing position.

By far the largest demand for mining engineers and trained subordinates comes from the coal fields situated in the provinces of Bengal and Bihar and Orissa. The forms of mining in other parts of India are often only mere quarrying or, where actual mining is practised, are either so highly specialised as to necessitate a practical training which cannot be given in India, or are only on a small scale. It is clear, then, that for a long time to come, India must look for mining education to an institution or institutions based on the requirements of the Bengal coal field.

The provision at present made for mining education comprises—(1) courses at the Sibpur College, (2) evening classes on the coal field. The senior Sibpur course is one of two years, which follows a preliminary two years' training leading up to the examination for sub-overseers. The students are trained in mine surveying, electricity, colliery mechanics, mining and chemistry, and are taken into camp on the coal field for six weeks in the cold weather. At the end of this course they obtain a diploma, after passing an examination. Recently, however, the Government of India have approved of the reduction of the two years' mining course to a single year, conditionally on the students who take up the course having previously passed the overseers' examination and spending at least eight weeks in a colliery during the college vacation. A preparatory course of one year is also being provided. Under the previous conditions it was not easy for students from other provinces than Bengal to obtain admission, though it is only fair to add that very few attempted to do so. Accommodation was limited, and the Local Government stipulated that no qualified Bengali student should be excluded. The necessity for passing the sub-overseers' test before entry was also a difficulty in the case of students from certain provinces, where training of this class was given only to a very limited extent. These obstacles have now, it is claimed, to some extent been overcome, and there are at present (1918) five outside students taking the course. For some years past, the removal of Sibpur College has been under contemplation, and Government has been reluctant to incur increased expenditure on the existing institution. Accommodation is thus still inadequate.

(a) Sibpur College courses.

The evening classes are held at five centres on the coal field under the control of a joint board, on which the mining interests and the Governments of Bengal and of Bihar and Orissa are represented. The cost of these classes is met by the two Governments.

(b) Evening classes on the coal field.

The results of the examinations held at Sibpur and in connection with the evening classes are shown below:—

—	1912-13.		1913-14.		1914-15.		1915-16.		1916-17.	
	Appeared.	Passed.	Appeared.	Passed.	Appeared.	Passed.	Appeared.	Passed.	Appeared.	Passed.
Sibpur College .	4	2	4	2	3	3	3	3	5	5
Evening classes .	40	17	26	16	24	12	26	17	27	26

The average attendance at the evening classes in 1915-16 was 120, and that of the vernacular evening classes was 264.

Recent proposals for improvement.

167. In 1913-14, a committee, which met under the presidency of Sir D. Macpherson to advise on the question of mining education, recommended the opening of a school of mines at Dhanbaid and the improvement of the existing evening classes on the coal field. The school was to cost Rs. 5,56,000 initial, and Rs. 98,000 recurring, while the expenditure required for improving the evening classes was estimated at Rs. 1,51,000 initial and Rs. 71,000 recurring, towards which latter figure it was hoped that the mining industry would contribute. In 1914-15, a committee consisting of Messrs. Adams, Chief Inspector of Mines in India, Roberton, Professor of Mining at Sibpur, and Glen George, Mining Engineer, after examining the system of mining education in England, submitted a report which was in general agreement with the proposals of the Macpherson Committee.

Insufficiency of evening classes as sole means of instruction.

168. Two main points arise for consideration in connection with the above proposals—(1) would an improvement of the existing evening classes suffice, without a school of mines? (2) if a school of mines is considered necessary, where should it be located?

With regard to the first point we observe that the lads who attend the evening classes are in most cases deficient in general education, and this fact, coupled with the necessarily limited range of instruction given, renders these classes unsuitable for training first-class colliery

managers. Out of the nine men who obtained first-class certificates in 1916, six men came from Sibpur. It is true that in England the larger proportion of colliery managers have obtained their mining education at evening or other similar classes; and of the comparatively small number of students who are found at the various schools of mines, most seek employment either in metalliferous mines, or as consultants, Government inspectors, and geologists. But the position in England has changed; the examination for the manager's certificate has been made more severe, and mining schools of a different type are springing up, in one case financed and controlled by the mining interests themselves; this type is therefore likely to take a large share in producing colliery managers. We think it necessary that, although the evening classes require improvement, some form of mining school should be provided for holders of first-class certificates, *i.e.*, certificates entitling a man to hold charge of a colliery raising over 1,800 tons a month.

Location of the proposed school of mines.

169. We now come to the question of the location of the school of mines, and we may consider whether a self-contained mining school on the coal field itself is preferable, or whether teaching might not be provided in a department of an existing engineering college, such as Sibpur. The latter scheme would be cheaper; it would bring the students into contact with lads studying for other branches of engineering, which is advantageous; and a well-known institution like Sibpur would possess better and more established traditions than any new institution. Finally, as we have already pointed out, Sibpur already produces most of the successful candidates for first-class certificates.

On the other hand, there are disadvantages attaching to the Sibpur institution. Visits to coal mines from time to time during the course to explain points of practice can be completed from Dhanbaid within a few hours; from Sibpur they take not less than 36 hours. The staff of an institution on the coal field is in close touch, not only with the latest developments of the industry, but with employers and managers, a great advantage to the students both while under training and afterwards when seeking for employment. A sub-committee appointed in 1916 to consider the future of the Sibpur mining class, reported that it would be very hard for teachers at Sibpur to secure practical training for students in collieries, while the staff at a school in the coal field could do this with comparative ease. To keep the school in close association with the industry is also a matter of importance. Finally, the staff of a school on the coal fields can maintain intimate relations with those of its students who are taking the practical portion of their course at one or other of the mines.

170. So far, therefore, as the choice lies between Sibpur and Dhanbaid, we prefer the idea of a self-contained mining school on the coal field; but are prepared to agree that, instead of the course of three years at the school and twelve months' preliminary practical work proposed by the Macpherson Committee, students may take their practi-

cal course at the end of their first year. We consider it essential that students should pass a reasonable period in underground work.

We are conscious of the heavy cost which such an institution is likely to entail relatively to the number of the students, at any rate for the first few years of its existence. The Macpherson Committee did not anticipate a larger number of students at first than 48, an estimate which might, however, now be increased. But we consider that the necessity of training mine managers in India and of making the country so far independent of imported experts, is strong enough to warrant the expenditure. The number of students attending the course at Sibpur is increasing; and if the proposed school is open to the whole of India, this should bring in still more candidates. The argument for an inter-provincial institution lies, not in the desire shown by the different provinces of India to train their own men to manage their own mines, but in the absolute necessity of extending the area of recruitment for the mining profession as widely as possible, in order to supply this urgent need by the most suitable men from every part of the country. The main advantage would, it is true, be reaped by the coal fields of Bengal and Bihar and Orissa, and candidates from these provinces would retain the undoubted advantages which proximity to the school of mines must always give. But there should be no preference shown to local candidates and admission to the school of mines should depend on suitability alone.

171. There is, however, a possible third course, besides a school of mines at Dhanbaid, or a mining class at Sibpur. Various proposals have come to our notice for research and training in metallurgy and other allied forms of technology, proposals which we have discussed more fully in Chapter IX. An institution at Sakchi teaching the above subjects would naturally also include certain forms of mechanical engineering, in view of the unrivalled opportunities which would be provided by the group of works springing up near that centre. Many of the science subjects which will have to be taught as a foundation in such an institution will be common both to mining and metallurgy; these will include geology and mineralogy, physics, chemistry, mathematics, and mechanics; and among practical subjects, mechanical and electrical engineering. A considerable saving in cost could be effected, and a more efficient staff and equipment provided, by combining in the same institution the higher forms of training for mining and metallurgy. We recognise, however, that a school of mines and metallurgy at Sakchi, though preferable to classes at an unrelated centre like Sibpur, would be in less intimate touch with the coal-mining industry than a school at Dhanbaid, and, in view of the great desirability of keeping the mining industry in the closest possible relations with mining education, we support the proposal to establish a school of mines at Dhanbaid. Until this is done, the Sibpur classes should be maintained and teaching steadily improved on lines that would permit of the transfer of the classes to Dhanbaid. The Sakchi institution would naturally specialise in metallurgy and related forms of applied chemistry which

would constitute a group sufficiently wide in range for a high-grade nstitution.

172. The Government of Bihar and Orissa have consulted us about a proposal to start a technical school at Sakchi for the metallurgical industries which are likely to develope in that neighbourhood in association with the works of the Tata Iron and Steel Company. We are much impressed by the possibilities of this centre, and the great opportunities which it will offer for employment to men possessing a technical training. We consider that there will be ample scope for a school of the type proposed, both before and after the starting of still higher institutions for specialist training and for research; and we have conveyed to the Bihar and Orissa Government our general approval of their scheme.

The proposed Sakchi school for metallurgical training.

Miscellaneous Educational Proposals.

173. We have elsewhere in our report indicated ship-building as a potential Indian industry of the future, though one that perhaps will not materialise for some time unless the necessary plates, sections, and engines are imported from abroad. Be this as it may, there is no reason why India should not be ready to man her own ships when they are built. She has already for many years past provided excellent crews for the ships of other nations; and, given facilities for education in nautical subjects and marine engineering, she should in course of time be able to supplement these crews, at any rate in the coasting trade, with capable officers and engineers. The supply of such men from Britain must be very short for many years to come, if not always in future, and facilities for recruitment in India would do much to render her self-supporting in case of another great war. There have been frequent demands, especially on the Bombay side, for training of this nature for young Indians, but we have been unable to obtain any authoritative or helpful information as to the lines on which the subject could be taken up, and are, therefore, unable to dilate upon it. It requires expert knowledge of a particular kind, and could only be satisfactorily handled by a committee specially appointed for the purpose, as it would necessitate the establishment of at least one school of navigation in the country and the provision of one or more training ships.

Navigation and marine engineering.

174. During the course of our tours, the necessity for special schools and colleges of commerce was frequently brought to our notice by Indian witnesses, who were in many cases men with considerable practical experience. On the other hand, some European witnesses expressed grave doubts as to the utility of such institutions and insisted that only in an office could the training be given that would turn out a useful business man. This divergence of opinion is, we conceive, largely due to the different standpoints from which these two classes regard the question. We

Commercial education.

are inclined to think that the European evidence which we have received is not based upon a sufficiently wide examination of the circumstances in which trade and commerce are carried on by Indians, and a full acquaintance with the educational system which has grown up in the country.

It is obviously beneficial to any Indian about to engage in commerce, who desires to rise above the rank of a clerk, that his education should be specifically adapted to his career, and should also be carried to the University stage. The greatest benefit from a high commercial training is likely to be received at present by sons or relations of commercial men who intend to enter the family business; this type was well represented in the Sydenham College of Commerce of Bombay. The school of commerce should provide teaching in shorthand, type-writing, the methods of book-keeping and précis writing and, above all, in modern English. These subjects may be regarded as essential for the routine working of an office, but to them should be added instruction in the mechanism of banking, exchange, and foreign trade, together with such subjects as commercial geography and a detailed study of the economic resources of India. There are already in India a number of schools of this type, some of which are efficiently managed; but the majority do little more than teach shorthand and type-writing, and make an attempt to impart a knowledge of book-keeping that is of little or no practical value. Most of these schools take the form of evening classes and are frequented by young clerks.

175. Higher commercial education is still in its infancy in India, and the only institution of University rank that has so far been started is the Sydenham College of Commerce in Bombay, which prepares undergraduates of the University for the examinations leading to the degree of Bachelor of Commerce, instituted by the Bombay University in 1912. Sufficient time has not yet elapsed to enable a definite opinion to be expressed as to the extent to which the aims of the founders are likely to be realised; but so far, the students who have passed out have been well received by the Bombay mercantile community, and have obtained employment on much better terms than their contemporaries who have taken the ordinary Arts course. The college is popular and it is likely to continue so, until the supply of commercial graduates is in excess of the demand. This cannot happen so long as the Sydenham College remains the sole commercial educational institution of University rank; but there is a strongly expressed desire for similar colleges in other parts of India, and we think that the other Indian Universities might well consider the possibility of satisfying this demand. Industry and commerce are bound to go on expanding rapidly, and they will be glad to pay a higher price for more efficient employés. The practice of more up-to-date methods of business and account-keeping is certain to spread into the mofussil, as familiarity with modern trade and industry increases. An alternative University course, in any case, has the advantage of widening the educational basis, and, provided the University commercial courses supply as good a training to

the mental faculties as do the present Arts courses, they deserve encouragement on their own merits, as part of the general educational scheme of the country. The relations between the governing bodies of colleges of commerce and Universities should be exactly similar to those which we have suggested for technological institutions, as outlined in paragraph 160. We attach great importance to the co-operation of business men in the control and this, we think, can be secured in the way there indicated.

The provision of teachers for industrial and technical education.

176. The provision of teachers for the various grades of education described in this chapter is not a question that needs discussion at any great length. For instruction in the higher branches of engineering and technology, we must look to the University colleges and technological institutes to provide teachers. They will be trained under the influence of men of high attainments engaged in original work, who will present their subjects in a way that will evoke a real and abiding interest among the students, and ensure that men who pass through their classes are thoroughly imbued with a clear knowledge of their subject and of right methods in dealing with it. Some of these will be fitted for teaching work by a natural capacity for the clear exposition of ideas. It must be remembered that research and what may be termed 'workshop practice' are themselves the best possible training for those faculties which a teacher largely uses, and that in consequence, in the case of subjects outside the line of general education, special training schools or colleges are unnecessary and even likely to be a disadvantage. There is not the least probability that educational appointments will fail to attract men who have been trained for technological or industrial work. Compared with factory life, the work of a teacher in a school or college offers inducements to a very large number of persons who prefer a certain amount of ease and freedom from worry to the strenuous existence, which is essential to success in manufacturing concerns. Appointments as teachers will naturally be sought after by men who feel that they have some special aptitude for such work, and provided suitable selections are made, actual experience in teaching will ultimately produce the high type of men required.

It is only when we come to industrial education, whether in organised workshops or in schools for cottage workers, that difficulties are likely to arise. The artisans from whom the teachers of craftsmanship will be drawn, have hitherto as a class been lacking in general education and have learned their craft on purely empirical lines. We have, however, provided an adequate remedy in the superior inspection staff and in the trained managers and supervisors who would be placed at the heads of these institutions. The latter should be specially recruited at first, though in the case of schools for iron work and carpentry they may subsequently be obtained from the students who have passed through the proposed classes in mechanical engineering and have obtained some degree of practical experience afterwards. It would be the business

of these men to train their own staff, and experience has shown that in a few instances at least they have been able to do it. Skill in craftsmanship is acquired by example and by practice rather than by precept, and those who are responsible for the training of artisans will see that the methods employed are correct, that the appliances in use are suitable, and that the instructors possess the necessary skill to enable them to show their pupils how work should be done.

The Control of Technical and Industrial Education.

Arguments for control by Department of Education.

177. Although we have proposed to place the control of technical and industrial education under the Departments of Industries, we are aware that, especially in regard to the former class of education, there is a strong body of opinion in favour of retaining it under the Director of Public Instruction.

This opinion appears to be based on the following grounds; firstly, that the Department of Education cannot be dissociated from these forms of teaching without loss, on account of the importance of method, with which that department is naturally more familiar than any other; secondly, that any form of teaching which is removed from the Department of Education may lose prestige in the popular mind; thirdly, that all technical and industrial training must include some degree of general education, with which the Department of Education is organised to deal.

Arguments for control by Department of Industries.

178. In meeting these arguments, it must be borne in mind that, in the first place, education designed to produce men who will readily find industrial employment must in any case be very largely controlled by an agency which, by its training and constant association, is in touch with the industries that will furnish that employment. Both in devising educational schemes and in ensuring by inspection that they are actually followed in working, this class of agency must have a predominant part. It is not enough to appoint a man with an industrial training as an inspector of industrial schools; he must throughout be kept in touch with industries and industrialists, or the training given will soon degenerate. Speaking generally, the different forms of technical and industrial education have as their object either the training of a man who will ultimately direct industrial operations or the production of a workman skilled in some form of handicraft. Of the success of the teaching, the private industria employer must remain the ultimate judge. The Department of Industries is the only Government organisation capable of entering into his point of view, and the only one with which he can readily associate himself. It is the only agency of any kind that can correlate the training to the requirements as ascertained by it. Almost every educationalist of standing who appeared before us was in general agreement with these views.

Our conclusions are strengthened by a consideration of the nature of the various forms of technical and industrial education, the necessity of which has been indicated in our report. In the case of industrial schools, where craftsmanship is the all-essential feature of the training, the small amount of elementary general education that is required can easily be supervised by any person of ordinary intelligence, whilst the teaching of craftsmanship must be provided and controlled by an agency which knows from practical experience the type of employé required by an industry, and can judge if the requirements have been fulfilled. This the Education Department is not likely to be able to do, judging by the results of its past efforts in this direction. In the case of artisans who are trained in shops, the same arguments apply; and it will be easier for a Department of Industries to maintain the necessary relations with railway or private shop managements. The superior training for foremen, which will be given under somewhat similar conditions but to better educated persons, and will involve a greater amount of theoretical teaching, seems to fall into the same category; the only question is whether the theoretical teaching requires any degree of control by experts in the methods of imparting teaching generally. The danger of allowing the theoretical to outweigh the practical aspect of the training must be remembered. It must also not be forgotten that the experience of industrial and technical training in other countries has evolved its own theories, traditions and expert teachers, of which the Department of Industries can make a more understanding use than the Department of Education. The control of the foregoing forms of education should, therefore, rest with the Department of Industries; but the advice and co-operation of the Department of Education should be obtained in respect of general educational subjects, both in framing the courses of instruction and in deciding on the methods of teaching and inspection.

It is only where some form of higher theoretical instruction is needed, such as that proposed by us for engineers and specialised technologists, that any question arises of the participation of the Department of Education in the control. Part of the education of engineers and the entire training of men for posts of specialised technologists should, we have suggested, be given in institutions of collegiate rank. Their expenditure should be administered and their teaching controlled by joint boards, on which the Department of Industries, the local University and employers should be represented. We have already explained the relations which should exist between the Universities and these colleges.

Necessity for Imperial visiting officers.

179. We desire here to draw attention to the great diversity of practice which has hitherto prevailed in the methods of imparting industrial and technical education of all kinds in different parts of India, a diversity which has unfortunately permitted the existence of much inefficient or misdirected teaching. We think it necessary, for some time at any rate, to arrange for the provision of a system of regular

visits by specialist officers of the Imperial Department of Industries. There is at present in the various provinces no generally accepted tradition of correct methods in these forms of teaching, and we think that Local Governments and Departments of Industries would be greatly assisted in their efforts to create one, by occasional visits from imperial officers, whose functions would be merely advisory, and would be confined to placing their notes and observations before the Local Governments for consideration. The specialist visitors would form a convenient channel for transmission to one province of useful experience acquired by another, and this would enable Local Governments, while retaining complete control of their own industrial and technical education, to profit by the knowledge gained elsewhere.

CHAPTER XI.

Commercial and Industrial Intelligence.

Objects of a Commercial Intelligence Department.

180. In dealing with this question, we have had the advantage of perusing two recent despatches of the Government of India to the Secretary of State, proposing the re-organisation of the Commercial Intelligence Department and the appointment, which has since been made, of an Indian Trade Commissioner in London. These despatches have amply demonstrated the importance to Government of full and frequent information regarding commercial developments and requirements, and of the maintenance of close touch with such organisations as Chambers of Commerce and Trades Associations. We have also had complaints from many of the witnesses whom we have examined that there exists no clearly defined channel through which information on commercial matters in the possession of Government can be communicated, whether publicly or to individual applicants. There is, moreover, a general feeling that the collection, careful analysis and judicious distribution of commercial and industrial intelligence is a necessary feature of Government policy both in war and peace. The question has not hitherto been so treated as to afford Government a sufficient basis for the encouragement of industries in India or for political and diplomatic action abroad. With this end in view, we suggest a scheme whereby commercial and industrial intelligence may be organised on lines that will assist this country to become better equipped for the industrial struggle.

Necessity for collection of statistics by an expert agency.

181. In designing this organisation, we have had before us these two main points ; first, the importance of having the information collected and the statistics analysed and expressed for public consumption by experts who have concrete ideas as to the use which can be made of them by practical industrialists and commercial men ; second, the necessity of adopting a system which will enable these statistics to be issued in a form that will make them readily accessible to the commercial public. With regard to the first point, we consider it to be of prime importance to insist that, where a specialist department concerned with industries exists, it should handle the statistics and information relating to those industries. Unless this be done, irrelevant data will be collected, essential facts will be overlooked, and inaccuracies will follow from inexpert interpretation of trade terms. Several instances have been brought to our notice in which statistics

regarding articles of unlike denomination were added together to make totals, and others in which failure to recognise the meaning of trade terms resulted in the compilation of figures which were either useless or misleading. Constant association with the general economic position of his industry is the only means that will render the industrial specialist a safe adviser to Government on commercial matters and enable him to direct his researches with a view to anticipating possible dangers. We consider it advisable to emphasise the commonplace that commercial statistics and intelligence are intended to serve as the basis of an active policy, and not merely as a means for explaining changes years after they have occurred. If handled by the expert, such figures will serve as a timely warning against attempts of aggressive nations to capture our trade, or to determine its direction in their own interests. To show the value of having statistics collated and analysed by appropriate specialists, we may cite the Railway Administration Report and the Quinquennial Review of Mineral Production as instances bearing differently on questions of administration and policy.

The information which we include under the head of commercial and industrial intelligence will consist of the following :—

(1) statistics and other information regarding the movement of internal and overseas trade ;

(2) statistics and other information regarding the production and working of Indian industries ;

(3) information regarding trade usages in India and abroad, and the tariff and industrial policy of foreign nations.

Collection of statistics and information by provincial agency.

182. Our proposals relating to the provincial Departments of Industries contemplate that their Directors should qualify themselves as advisers to their Governments in matters relating to trade and commerce, and we have proposed that it should be one of their definite duties to supply advice and information to the public in regard to existing or new industries. Both for this reason, and in view of the considerations adduced in Chapter XII, it is obvious that they will have to maintain intimate relations with the manufacturers as well as with the merchants of their provinces, and to study and interpret all the statistical information which is of use in the conduct or administration of commerce. The staff of each provincial Director should include experts to deal with special problems, and, as there will be representatives of the department in every part of the province, it will be possible to maintain current and continuous records of what is going on in it.

Control of Department of Commercial and Industrial Intelligence.

183. The information comprised under the head of commercial and industrial intelligence obviously includes matters of interest to Government both on the commercial and industrial sides, as well as to private traders and industrialists, from whom enquiries may be expected on a wide variety of subjects, including requests for

information on technical matters. If our principle be accepted that the statistics and intelligence relating to industries and commerce can be handled effectively only by the specialists who conduct the various forms of research and practical work intended to extend and develope Indian industries, it naturally follows that the figures for production as well as those for trade should be collected and analysed by the same organisation. On the whole, therefore, there is a distinct balance of advantage in favour of placing the whole of this work under the general control of the Department of Industries and in the hands of a single officer, whom we would designate the Director of Commercial and Industrial Intelligence. In consequence of their imperfect knowledge of the working of Government, firms and individuals who are anxious to obtain information with regard to trade movements, sources of production, suitable raw materials and technical processes, will often come to this officer in the first instance for information. It is, however, extremely important to keep in mind the harm that may be done, should any single officer give information on subjects in which he is not a technical or commercial expert. Thus an important function of the Director of Commercial and Industrial Intelligence would be to refer applicants for information and advice to the appropriate departments of Government from which these can be obtained at first hand. The Director should be a member of the Imperial Industrial Service which we propose in Chapter XXII, and his headquarters should be at Calcutta.

Special Officers for Calcutta and Bombay.

184. We consider that special commercial intelligence officers will be required for Calcutta and Bombay. These two large cities contain trading interests which involve such extensive relations with other provinces and foreign countries as to render necessary, at any rate for some time to come, the appointment of special officers working under the provincial Directors of Industries but communicating direct, when necessary, with the Director of Commercial and Industrial Intelligence. In other provinces the Director of Industries will not have such highly organised centres of trade to deal with and should be able, we think, to keep himself fully in touch with local developments.

Method in which statistics and information should be dealt with by Imperial agency.

185. The bulk of the information with which the Director of Commercial and Industrial Intelligence would deal, would be obtained by him as a routine matter from the provincial departments, including the special provincial officers for commercial intelligence whom we have proposed for Calcutta and Bombay. The remaining sources of statistical information would be the Customs Department, the Railways, and other agencies which collect these figures at present. They should be published without comment in the first instance by the Director of Statistics when compilation on an imperial basis is required ; in other cases by provincial Directors of Industries or by the other collecting agencies. These last

will be advised by the expert authorities, imperial or provincial, as to the form in which the information should be tabulated. The advice of local committees of business men will be of assistance in this respect. The statistics should, where necessary, be interpreted and commented on by expert departments, where these exist, or, in their absence, by the Director of Commercial and Industrial Intelligence or by provincial Directors of Industries. It will be clear from what we have said above that the Director of Statistics should be a compiling officer only, and that he should not comment on statistics with which his relations are merely arithmetical.

Statistics of production and employment.

186. Information regarding production and employment has been in the past exceedingly defective. In the case of production, official figures have been confined almost entirely to the main industries, whose representative associations make it their business to collect them. This is a practice that should receive every encouragement, and Government should co-operate with such associations, helping them in the collection of their figures, where help is necessary, and obtaining their advice regarding the figures of interest to the trade which Government collects itself. Where no suitable associations exist, the collection of statistics of production should be taken up by Government through provincial Departments of Industries, to the extent that may be considered practicable and useful in each case. We recognise the difficulties that exist, and the necessity of leaving details to be worked out by the industrial organisation of the future.

Statistics regarding employment, including occupation and wages, have hitherto been of little use, partly because labour was not willing to move freely, partly because the figures were out of date when published and were often injudiciously selected. In the case of unorganised industries, the definitions of the various classes of labour were not sufficiently precise, with the result that wages appeared to range between very wide limits. In future, the increasing demand for labour and its increasing fluidity will make information of this class of much greater importance to employers. It need not always be statistical in form, so long as it is reliable and up to date. A report that a certain class of labour is seeking employment in a particular district, if promptly issued, is of much more use than a statement of the wages it drew last year. The information which local Departments of Industries should be in a position to supply ought to be of more value to employers than that available hitherto.

General summary of proposals.

187. The effect of these proposals on the way in which information, especially of a statistical nature, so far as it is of interest in connection with industries, should be collected, compiled, published and commented on, is exhibited in the accompanying table.

—	Agricultural.	Forest.	Rail-borne Trade.	Customs.
Collected by	Director of Agriculture or Land Records, who forwards to Director of Industries for record and use.	Chief Conservator or Conservator of Forests, who forwards to Director of Industries (local) for record and use.	Railways, who forward to Director of Industries for provincial totalling.	Collector of Customs, who forwards to Director of Industries (local) for record and use.
Compiled by	Director of Statistics, who forwards to Director of Commercial and Industrial Intelligence for record and use.	Director of Statistics, Inspector-General of Forests.	Director of Statistics . .	Director of Statistics.
Published by	Director of Agriculture or Land Records (local).	Provincial Forest Department (local) Inspector-General of Forests (imperial).	Director of Industries (provincial).	Collector of Customs (local)
	Director of Statistics (imperial)	Director of Statistics (imperial)	Director of Statistics (imperial)	Director of Statistics (imperial).
Commented on by	Director of Agriculture or Land Records (local). Suitable Agricultural Officer under the Government of India (imperial).	Provincial Forest Department (local). Inspector-General of Forests (imperial).	Director of Industries (local) Director of Commercial and Industrial Intelligence (imperial).	Collector of Customs (local). Director of Commercial and Industrial Intelligence imperial).

Note.—'Collect' refers to the collection of figures in a province or local area and the production of provincial or local totals.
'Compile' refers to the compilation of provincial totals into imperial totals.

—	Mineral.	Road and river traffic.	Production.	Employment.	Prices of articles of industrial importance.
Collected by	Director of Industries	Director of Industries	Director of Industries	Director of Industries	Director of Industries and Director of Land Records.
Compiled by	Chief Inspector of Mines*	Director of Statistics	Director of Statistics	Director of Statistics	Director of Satistics.
	Director of Geological Survey.				
	Director of Statistics				
Published by	Director of Geological Survey (imperial).	Director of Industries (local).	Director of Industries (local).	Director of Industries (local).	Director of Industries (local).
	Director of Statistics (imperial).	Director of Statistics (imperial).	Head of technical department (where such exists). Director of Statistics (imperial).	Director of Statistics (imperial).	Director of Statistics (imperial).
Commented on by	Director of Geological Survey (imperial).	Director of Industries (local).	Director of Industries (local).	Director of Industries (local).	Director of Industries (local).
	Chief Inspector of Mines*	Director of Commercial and Industrial Intelligence (imperial).	Director of Commercial and Industrial Intelligence, or head of technical department (where such exists).	Director of Commercial and Industrial Intelligence, or head of technical department (where such exists).	Director of Commercial and Industrial Intelligence, or head of technical department (where such exists).

* For mines under the Mines Act.

Note.—'Collect' refers to collection of figures in a province or local area and the production of provincial or local totals.
'Compile' refers to the compilation of provincial totals into imperial totals.

188. Commercial men have emphasised to us the importance of the prompt issue of accurate crop forecasts. It would appear that these are not at present altogether satisfactory, especially those relating to the jute crop, which presents peculiar difficulties, chiefly owing to the fact that the bulk of the crop is grown in areas under the Permanent Settlement where no village records are maintained. The preparation of forecasts is a highly technical business which ought to be entrusted, as soon as possible, to the officers of the Agricultural Department, and their value must largely depend upon the amount of time which Directors of Agriculture and their staff can devote to the subject. As we have had occasion to remark elsewhere, this service is very much undermanned, and the accuracy of these returns may be expected to improve with the development of the department. We do not approve of the present practice whereby the Director of Statistics, as compiling officer, has to undertake the responsibility of amending the forecasts of provincial officers. Such a duty, we consider, would be more appropriately performed by some responsible officer with general experience of Indian agricultural conditions.

Crop forecasts.

189. We think that in order to complete the organisation necessary to provide the people of India with information in regard to industrial and commercial matters, the recent appointment in London of an officer of the Indian Government as Trade Commissioner was a very necessary step. He will represent Indian trade interests, and his principal function will be to stimulate the development of the Indian export trade, by directing attention to fresh markets and by promoting the establishment of new commercial relations likely to be beneficial to India. He should also assist the imperial and provincial Departments of Industries by answering definite enquiries.

The Indian Trade Commissioner in London.

An experienced officer, who exercised the functions of Indian Trade Commissioner in London for a few months during the winter of 1914-15, under by no means favourable conditions, stated before us that the appointment was greatly appreciated, that produce brokers in London and manufacturers in the country freely applied to him for information and advice, and that these references led in many cases to actual business. There cannot, therefore, be any doubt that, if this appointment form part, as we contemplate that it should, of an organised scheme for the promotion of industries and commerce in India, it will prove to be one of growing importance. The office of the Indian Trade Commissioner should be in the City of London, so as to be as close as possible to the business houses with which he will chiefly have to deal. Manufacturing and commercial firms in India usually find it necessary to have London correspondents, and there is no doubt that Directors of Industries will find their work greatly facilitated by the presence of an officer in London to whom they can refer whenever necessary. Hitherto such enquiries have had to be addressed either to the Commercial Intelligence Branch of the Board of Trade or to the Imperial Institute, and although

assistance may have been obtained in this way, the field of usefulness is limited, if only by the fact that neither of these bodies can command the services of men with up-to-date experience of Indian trade and commerce.

The appointment of Indian Trade Commissioner, like that of the Director of Commercial and Industrial Intelligence in India, should be included in the cadre of the Imperial Industrial Service, and it should ordinarily be held by an officer of that service deputed to England for the purpose. The experience gained by an officer holding this post should greatly enhance his value when he returns to India. The tenure of the appointment should usually be for a period of five years, and, though at first it may be held by an officer of the status of provincial Director, we recognise that it is likely to increase greatly in importance. The Trade Commissioner should be assisted by members of the Agricultural, Forest and Geological Survey Departments, in order to supply first-hand information regarding the chief raw products available in India. These officers should be temporarily seconded from their own services for comparatively short periods, so that the knowledge of Indian conditions in the Trade Commissioner's office may be always abreast of the times. It is essential that they should have sufficient experience and status to enable them to give reliable opinions on questions of fact, and that they should be sufficiently junior to turn their experience to useful account on their return to India ; the appointment of officers of about ten years' service should meet these conditions.

We are of opinion that the Trade Commissioner should devote special attention to the needs of small Indian exporters and capitalists, who desire information regarding openings for foreign trade, and assistance in obtaining plant for their enterprises. We regard the appointment of an Indian assistant to the Trade Commissioner, which was made last year, as a useful step in this direction.

Indian trade representatives abroad.

190. The desirability of establishing Indian trade agencies in other countries, such as East Africa and Mesopotamia, with which there is likely to be considerable business after the war, should also be examined.

The Indian Trade Journal.

191. In addition to the supply of specific information to individual applicants, both the imperial and provincial Departments of Industries will be able to furnish the public with much useful information as the result of their enquiries and experiments. Hitherto, this has been attempted either through the agency of the Indian Trade Journal, by means of bulletins published locally or by reports submitted to Government which have been made available for subsequent publication by the press. This practice should be adopted more extensively in future, and to this end care must be taken to keep in close touch with the press and to ensure its co-operation, which will, we feel certain, be readily forthcoming. Some witnesses, but not many, expressed their approval of the Indian

Trade Journal. Others described it as mere "scissors and paste." Our own consideration of the case leads us to the opinion that it should be discontinued, and that all official information should be issued by the Director of Commercial and Industrial Intelligence in the form of bulletins based on information derived from the imperial and provincial departments. In the case of some technical departments, the outturn of literature may be sufficient to justify the maintenance of independent special series. Bulletins should be printed in a form convenient for record, and each should deal with only one subject. They might then be issued periodically in packets to those bodies and individuals entitled to receive them, the list of which should be regularly revised and brought up to date. To the general public, they should be available at a moderate charge, either singly, in groups, or in complete sets.

The question of the publication of any of these bulletins in the vernacular and of the selection of the vernacular itself is for Local Governments to decide.

CHAPTER XII.

Government Purchase of Stores.

Failure of existing rules to secure local purchase to adequate extent.

192. Witnesses qualified to discuss the subject were, almost without exception, strongly of opinion that Government could do much to assist the development of industries in India by the adoption of a more liberal policy in regard to the purchase by public departments of such articles as are, or can be, manufactured in the country. It is true that the rules regulating these purchases have been amended from time to time, mainly in the above direction, and it was not so much the prescriptions themselves which were the subject of complaint, as the way in which they have been administered.

But from the enquiries that we have made, and from information privately received, we have come to the conclusion that the manufacturing capacity of the country has been far from sufficiently utilised by Government departments in the past, and we believe that the somewhat radical changes which we now propose will considerably stimulate industrial progress.

Those of our members who had the opportunity, when working with the Indian Munitions Board, of scrutinising the indents on the Stores Department of the India Office, found numerous instances in which articles were ordered from England, which could have been supplied by Indian manufacturers equally well both in respect of price and quality, if the latter could have relied on an established Government practice of local purchase. It was also observed that there was a totally unnecessary diversity in orders for the same class of articles, which could easily be avoided by the adoption of standard patterns or types, only to be deviated from when there are express reasons for doing so. This would reduce the number of individual heads, and would, in many cases, render it profitable to put down in India whatever special plant might be necessary.

The representatives of manufacturing firms in Great Britain who have established branches in India claim that, with their local knowledge, they could in many instances supply the requirements of Government much more expeditiously and more cheaply, if supplies were obtained direct from them rather than through the Stores Department of the India Office.

No specific evidence has been forthcoming as to the extent to which Indian manufacturers are handicapped in meeting the demands of

Government departments, by reason of the unfavourable position in which they are usually placed, when competing with tenders received by the India Office Stores Department in London. But of the actual fact there is no doubt. The Director-General of Stores is allowed considerable latitude in regard to the time he takes to furnish supplies. He is thus able to combine indents received from all parts of India and to purchase in bulk, whilst the Indian manufacturer is usually called upon unexpectedly to supply small quantities, at comparatively short notice.

Lack of local inspecting agency.

193. The local purchase of stores entails upon the officer making it the responsibility of ascertaining by inspection that the goods supplied are of the requisite quality, while by sending the indents to the India Office Stores Department, he is relieved of any trouble on this account. Frequently he knows little or nothing about the manufacture of the articles which he has to purchase; he has scanty means of ascertaining their market value; and he is unable easily to obtain expert and disinterested advice on such matters. With the exception of the Railway Board and the Ordnance Department, no department of Government, it is believed, was provided before the war with an efficient organisation for the inspection of local purchases, still less of local manufactures; and without such an organisation it is obvious that Government officers could not safely enter into large local contracts.

Change required in system of purchase.

194. It appears to us that, in the interests of Indian industries, a radical change should be made in the methods of purchasing in India Government and railway stores. The existing system has been handed down from a time when India was almost entirely dependent upon Europe for manufactured goods; but it is unsuited to modern conditions and has had a deterrent effect on attempts to develope new industries in India. As we have already said, we consider that the prescriptions of the Stores Rules regarding the classes of articles that may be bought in India are suitable, subject to the addition of a provision which, we understand, is now under consideration, regarding purchases from Indian branches of British manufacturing firms. The organisation which we are proposing will ensure that the fullest use is made of these prescriptions, in view of the progress which has been made, and will be made in the future, in Indian manufactures. Further experience of the working of an Indian Stores Department may, however, indicate the desirability of modifications.

Relative advantages of local and centralised systems of purchase.

195. The possibility of the local purchase of stores produced in India, but hitherto obtained in England, depends primarily on the existence of an expert agency in India, which will ensure that the stores obtained are of suitable quality and price, and we think that the same system should be applied to a large proportion of the articles already purchased in this country. Great economies have already been effected by the Munitions Board through the central-

ised purchase of local manufactures, expecially in the case of textiles; and it is a question for consideration how far the advantages of this system warrant its general adoption. The present system of local purchase by individual officers is in any case wasteful, and requires considerable modifications. Assuming the necessity of some form of centralisation, we have also to consider the advantages of provincial *versus* imperial buying and inspection. There are instances where a single province has a monopoly, as Bengal has of jute manufactures, or Bihar and Orissa of steel. There are some cases where the manufacturing equipment of certain provinces is vastly greater than that of others, whose demands are almost equally great. There are other cases where the provincial equipment is more nearly proportionate to provincial needs. Some provinces have local manufactures of tools or machinery, which it is desirable to encourage. If a purely provincial purchase organisation were adopted without any safeguards, provincial departments would be competing against each other with comparatively small orders to fill, and against the imperial organisation with much larger ones, thereby losing all the advantages of large-scale purchase and possible standardisation. On the other hand, the further distant he is from the manufacturer who supplies him, the less are the advantages of purchase in India to the indenting officer; and it is desirable, within reasonable limits and with due regard to economy, to encourage the industries of a province by the local purchase of provincial requirements. In some cases, the middle course might be adopted of arranging for running contracts by a central agency with local producers for local supply. Manufacturers in Calcutta, Bombay, or Madras, under this arrangement, would quote rates for the delivery of certain classes of goods in certain areas, fixed by agreement with the Controller-General of Stores, and local officers would fill their requirements from these. Such rates might be on a sliding or a fixed basis, according to the class of article. In any case, some means of mutual adjustment and of exchanging information regarding local prices and qualities is obviously needed. Moreover, if efficiency, whether in purchase or in inspection, is to be maintained, a certain minimum staff is required, and this staff will not vary greatly, whether the purchases made be few or many. If it be unduly reduced, adequate expert knowledge will no longer be forthcoming, and Local Governments will be accordingly exposed to the risk of being overcharged and of receiving inferior material.

Appointment of expert committee proposed.

196. No decision can be reached regarding the precise organisation which should be employed, or the degree of centralisation which it is desirable to adopt, until the whole question has been examined in detail by a small expert committee, with special reference to each of the leading classes of articles purchased, the extent to which they are produced in the different provinces, and the facilities with which local Departments of Industries can suitably be equipped for inspection and purchase. For the purposes of our financial estimate only, we have

found it necessary to assume a system of completely centralised purchase and inspection; but we feel sure that the proposed committee will be able to effect a considerable degree of decentralisation at the outset, and will provide for still further devolution, as the organisation developes and a settled policy becomes established.

Nature of future organisation.

197. Without anticipating the committee's conclusions as to how individual classes of stores should be treated, our own consideration of the question leads us to the view that the general nature of the future organisation should be on the following lines. There should be an imperial Department of Stores and provincial agencies which should form part of the provincial Departments of Industries. This would set free individual officers from the responsibility for the local purchase of most classes of stores, and provide for expert purchase and inspection. The imperial Department of Stores should have at its head a Controller General of Stores, with his headquarters at Calcutta; it would purchase and inspect stores, and deal with indents received from provincial Directors of Industries. In each provincial Department of Industries, there should be a stores branch, for the control of which, in the major provinces at any rate, an experienced officer would be required, who should be responsible for local purchases, and should utilise the staff of the department, as far as possible, for inspecting and testing the goods supplied through him.

All indents for stores required by provincial officers should come to the Director of Industries in the first instance. He would examine them and arrange for the local purchase and inspection of those items which could suitably be dealt with in this way. The Director of Industries would receive information, as explained below, from the Controller-General of Stores, which would enable him to form an opinion as to the possibility of obtaining more favourable tenders for such articles from another province, and it might be considered advisable in such cases for him to arrange for purchase and inspection through the local Director of such province. The balanee of the indents would be forwarded to the Controller-General of Stores, who would again examine them and issue orders for the purchase of the remaining items which in his opinion could be advantageously obtained in India. He would, as we have already indicated, in some cases enter into running contracts, in pursuance of which Directors of Industries would be able to purchase from contracting firms without further reference to him. In certain cases it would be best for him to effect purchases himself, whether under running contracts or as isolated transactions, where the articles could not conveniently be dealt with by provincial agency. Experience of local and imperial sources of supply would soon show what are the respective capacities of these for meeting orders; and, in practice, no delay would be involved in deciding what items would have to be obtained through the buying agency in England, which must, for some time to come,

continue to be the Stores Department of the India Office. All railway indents, which are at present sent to the Stores Department of the India Office, would be passed through the Controller-General of Stores, who would deal with them in the same way as with other indents. Orders on the firms of any province, whether from another provincial Department of Industries or from the Controller-General of Stores, would ordinarily go through the local Director of Industries, though, where centralised purchase is necessary, it would be in some cases desirable for the Controller-General of Stores to deal with local firms direct. Under this system the manufacturers of each province would be given the opportunity of supplying their own Local Governments, so far as they were able to do so, as well as those of other provinces in which similar manufactures have not been established. With the Controller-General of Stores would rest the responsibility of deciding whether indents are to be transmitted to London or local manufacture undertaken. Only in the case of heavy machinery and constructional iron work is there likely to be any difficulty in coming to a decision. In these cases much depends on the designs and specifications, and very highly specialised experience is required to ensure satisfactory results. This has hitherto been obtained in London through the agency of the consulting engineers employed by the India Office, and a similar technical agency will have to be created in India, if full advantage is to be taken of the increasing capacity of the country to turn out heavy work. The annual report of the Controller-General should include a classified statement of the articles obtained in India and abroad and the prices paid.

Importance of an efficient inspecting staff.

198. Inspection of local purchases would be carried out by the staffs of the local Departments of Industries, where they include suitable experts. But the range of Government requirements is so wide and involves the expenditure of such large sums, that the experts required for the assistance of provincial industries will be quite inadequate to inspect all the articles purchased locally : moreover, to require them to do so would in some cases cause delay and interfere with their ordinary work. The urgent necessity of securing economy and efficiency in the expenditure of the vast sums of money spent on the purchase of Government stores requires a very efficient and reliable staff of imperial inspectors, including a varied range of specialists, and we wish to point out that, though this staff may appear at first to be expensive, the cost of its maintenance will be small compared with the risks involved in purchasing stores without expert check. The activities of these officers would form one of the most valuable sources of industrial intelligence, and if, therefore, they are organised by an enlightened departmental head and are exchanged from time to time with officers employed under Local Governments in the encouragement of local industries, there is no doubt that the entertainment of this staff will be a real economy, both directly in the saving of money on purchases, and indirectly in the development of new industries. We contemplate that an arrangement will

grow up of a kind that would prevent undue interference with the provincial Directors in the purchase of local products and that consequently, while the right to inspect may exist, it will be exercised with judicious discretion and not in officious detail.

There is always a natural reluctance on the part of local purchasing officers to undertake the responsibility for quality. This feeling has, in fact, been one of the reasons why they have indented on the Stores Department instead of obtaining their requirements in India. We feel sure, therefore, that provincial purchasing officers will welcome the intervention of an imperial inspecting staff.

As we have stated above, we consider that one great advantage of the inspecting staff would be the transmission of information from one province to another regarding sources of production and improvements in manufacture, thus enabling each province to learn by the experience of others and facilitating more uniform progress in all parts of India. We propose that the Controller-General of Stores should work in close contact with the Director of Commercial and Industrial Intelligence. The arrangements for securing this object will be explained in Chapter XXII.

CHAPTER XIII.

Land Acquisition in Relation to Industries.

Difficulties of industrial concerns in acquiring land.

199. Many witnesses, representing both large and small interests, complained of the handicap imposed on industrial enterprise by difficulties in obtaining land for the sites of factories and other industrial concerns, and the surface rights of mines, in cases where mineral rights are not the property of Government. These difficulties are said to lie, first, in the trouble experienced in obtaining a good title, in view of the complicated system under which land is held in certain parts of the country, especially in Bengal, and in the absence in some provinces of an authentic record of rights; second, in provincial laws, designed to prevent the expropriation of tenant interests; and last, in the attitude of landowners, who are too apt to exploit unduly the necessities of an industrialist whose choice of the site for a new venture is limited by considerations of transport, water supply, etc., while he is still more fettered when he desires to extend an existing factory. There are also often cases where the land required belongs to a large number of small owners, and when any one of these declines to sell, his refusal may render the consent of the rest useless. We have also received complaints regarding the obstinate and dilatory attitude often taken up by landowners in negotiating transfers. Although the indefinite subdivision of titles in some parts of India renders these difficulties somewhat more acute, they are not, we recognise, by any means peculiar to this country.

Cases where a willing transferor is prevented by law from passing a clear title.

200. Before discussing the question of State expropriation of private property, we will deal with those cases in which a willing transferor is prevented by law from passing a clear title. The mechanism for meeting this difficulty will doubtless vary in different provinces. In the Punjab a transfer to a trader of land belonging to an agricultural tribe cannot be made without the special sanction of an executive officer; and a wide range of relatives and collaterals possess the right of pre-emption. Moreover, the reversioners of a transferor have, by Punjab customary law, the right to sue to set aside a transfer made without necessity. But in this province pre-emption rights have been already declared non-existent in certain areas adjoining large towns. In the Central Provinces means are being sought for enabling, under suitable conditions, a transfer of occupancy and ordinary holdings to be made, when the land is required for non-agricultural

purposes. Generally speaking, we consider that, although laws have been made to prevent certain classes of persons from being deprived of their rights in land, even by their own voluntary action, because the cultivation of that land by, or under the control of, other classes brings about an undesirable state of affairs, there is no reason why the same measures should be required for land which would not remain agricultural land after transfer. We have no hesitation, therefore, in recommending that provision should be made in local laws, where necessary, to enable tenants, who are prevented by legal restrictions from transferring their land or from conferring an absolute title therein, to do so with the sanction of some proper authority, when it is required for an industrial enterprise, more particularly for the housing of industrial labour; and this without depriving the proprietor of his existing rights of profit on such transfers.

We also recommend that Government, as an owner of land, should set an example to private proprietors of a liberal policy both in respect of its rules and of their practical application, in permitting transfers of land for industrial purposes.

Proposal for compulsory declaration of rights objectionable.

201. We are unable, however, to support a proposal which was put before us, to allow an industrial concern desirous of acquiring land to call on all persons affected to put in their declarations of all titles or interests in the land within a certain time, any subsequent claims being barred. This proposal would, we think, inflict hardship on ignorant title holders, *pardanashin* women and absentees, who are often themselves unaware of the precise extent of their rights.

Acquisition by Government on behalf of an industrial concern under section 40 of Land Acquisition Act.

202. The main question which was pressed on our attention was the desirability of a more uniform interpretation of the expression in section 40 (1) (*b*) of the Land Acquisition Act, which refers to the acquisition of land for a Company, that a work "is likely to prove useful to the public." The interpretation put on the wording of section 40, as indicated by the purposes for which this part of the Act has been used from time to time, seems to show some uncertainty as to the class of case to which it should be allowed to apply. There appears to be some division of opinion among legal authorities as to the circumstances in which the Land Acquisition Act can be fairly used by a Local Government on behalf of an ordinary industrial company. We are not sure, therefore, whether the Act needs revision to cover the recommendation which we make below.

The matter was carefully considered by the Bombay Advisory Committee, who suggested the following formula as a guide to Local Governments in the exercise of their discretion as to acquisition on behalf of an industrial concern :—" When . . . such acquisition is indispensable to the development of the industry, and . . . the development of the industry itself is in the interests of the general public." From this proposal there was found, on discussion with the committee,

to be at least one dissentient, who was inclined to hold that any such proposal for compulsory acquisition should be submitted to the Provincial Legislative Council, or at least to a specially constituted committee thereof. The idea of procedure by private bill in such cases was also discussed. These suggestions relate rather to the mechanism through which the Local Government should exercise its discretion, than to the principles which should guide it in forming its opinion, and we therefore think it unnecessary to consider them in detail here. We would recommend that the formula proposed by the Bombay Advisory Committee should be adopted with the following modifications :—

The Local Government may acquire land compulsorily from private owners on behalf of an industrial concern, when it is satisfied—

(1) that the industry itself will, on reaching a certain stage of development, be in the interest of the general public ;

(2) that there are no reasonable prospects of the industry reaching such a stage of development without the acquisition proposed ;

(3) that the proposed acquisition entails as little inconvenience to private rights as is possible, consistently with meeting the needs of the industry. In this connection we wish to draw particular attention to the desirability of avoiding, as far as possible, the acquisition of areas largely covered by residential buildings.

We also propose that, on the recommendation of local bodies, Government may compulsorily acquire land to provide fresh sites for industries, which it is necessary to remove on sanitary grounds, and for industrial dwellings. Further, when Government considers an industrial undertaking deserving of substantial assistance in other ways at the public expense, especially when it adopts such a course as an alternative to carrying on the industry itself, there seems no reason why land, when necessary, should not be acquired compulsorily.

It should be a *sine qua non* that, in all cases where land is acquired compulsorily for industrial enterprises, arrangements should be made to offer cultivators or house-owners so dispossessed suitable land in exchange or part exchange. Such a course will mitigate more than any mere money payment the hardship and sense of unfair treatment caused by expropriation.

CHAPTER XIV.

Technical Assistance to Industries by Government.

Reasons for adopting in India a policy of direct assistance to industrialists.

203. It is necessary to indicate in somewhat greater detail the special necessity which exists in India for direct Government participation in the initiation and improvement of industries by experiment by advice and help, and where necessary, by example. We think that in the peculiar circumstances existing in this country, any limitation of the functions of the State in accordance with the principles laid down by Lord Morley, which we have quoted in Chapter VIII, will render our proposals of little benefit to Indians and will also detract largely from their general usefulness.

The risks to which private enterprise is exposed in India or elsewhere, when embarking on industrial work in new directions, are proverbial. India, however, possesses one great advantage; the new industries or processes that may be started here are almost always old industries or processes in other countries, though they may require modifications to suit them to Indian conditions. On the other hand, the country's lack of industrial organisation, of private consultants and specialists, of information on the industrial value of raw materials, and of experience in the way of approaching industrial problems, are serious obstacles, especially to the smaller-scale undertakings. Under present Indian conditions, this class of organised industries has great possibilities and is in every way well suited to Indian enterprises in most parts of the country. But the Indian investor is most reluctant to risk his money in undertakings of this sort, unless they relate to industries which are already established and practised extensively. Of the readiness to invest money in industries which can already claim a number of successes, we have had abundant evidence; indeed this tendency has had the unfortunate effect, in some instances, of creating more individual undertakings than the industry can support. This seems, at any rate, to indicate that there is capital seeking industrial outlets, and that the directions in which it can be employed are at present, from the point of view of the Indian investor, insufficient. We are further confirmed in this view by the freedom with which money is forthcoming for new ventures where the management has earned public confidence.

Difficulties experienced by Indian industrialists.

204. If we are to suggest the way in which Government assistance can best be given, it is important for us to understand the difficulties of industrialists who engage in new undertakings in India, especially

on a small scale. The smaller industrialist, whether Indian or European, who is thinking of taking up a new venture, seldom has the advantage of a name which commands the confidence of a wide section of investors, or the support of large resources of his own, and he is thus not in a position to engage the assistance of experienced technical advisers in his preliminary investigations. The knowledge of the industry which he possesses is more often than not incomplete. He may have familiarised himself with it in actual operation in another country; but to start it in a new field demands greater practical experience and skill than he has usually acquired.

But even in the case of the larger undertakings, where funds are sufficient to engage expert technical advice, the following difficulties often occur:—

(1) There is frequently some uncertainty as to the quality and quantity of the raw material. At the outset, it may apparently be abundant at reasonable prices; but directly any demand for it is created, the supply falls off or prices unaccountably rise. It is, therefore, difficult to frame a safe estimate beforehand on this point, simple as it may seem.

(2) The industry may involve the training of labour to carry on its operations, and this may entail a very considerable initial outlay, adding greatly to the cost.

(3) Country-made articles competing with foreign imports are always looked upon with suspicion, and generally have to be sold at a much lower price to command a market, even when the quality is equally good.

(4) When success is attained, rival enterprises are immediately started, the trained labour is enticed away, the cost of the material is sometimes enhanced, and competition, possibly in a weak market, has to be faced, with the result that the monopoly upon which a new enterprise must count to recoup extraordinary initial expenditure rapidly vanishes, and profits are reduced to a level at which only those can work successfully who have benefited by the work of the pioneer without having had to pay for it.

The cautious individual realises these risks and refuses to be tempted into new paths. Those of a more sanguine temperament or with less experience are attracted and too often come to grief.

Some of the difficulties which we have enumerated above are common to new industrial efforts in all countries, and cannot be eliminated in India. But the Government organisation which we propose will at any rate ensure technical advice for the small industry, and adequate economic and scientific data for all classes of undertakings. This will furnish industrial enterprise of all kinds from the outset with much better prospects of success than in the past. We believe that public

opinion is completely changed in regard to the permissible limits of State activity, and that the grant of such assistance as we propose is urgently demanded.

205. We have already, in previous chapters, explained our views regarding the means of providing industrial research and the results that are likely to follow from it. We think it desirable now to explain the meaning which we attach to the terms "pioneering" and "demonstration," when applied to Government industrial undertakings started for the assistance of industries. These two expressions are often used as if they had the same meaning, and with the vague idea that they cover the whole field of Government assistance. In any case, they represent the greatest departure from the old *laissez-faire* standpoint; and it is for these reasons that we consider it advisable to describe the actual methods which these terms are intended to denote, and the limitations to which these methods should be subject.

Meaning of "pioneering" and "demonstration."

"Pioneering."

By "pioneering" we mean the inception by Government of an industry on a small commercial scale, in order to ascertain and overcome the initial difficulties, and discover if the industry can be worked at a profit. It must be clearly understood that Government should only undertake the pioneering of industries when private enterprise is not forthcoming, and that, as a general rule, Government participation should only be continued till the object with which the operations have been started has been fully attained. By this we do not mean that the Government factory should necessarily be closed down, as soon as a private individual or company is willing to take it over, or it has reached some degree of commercial success. The opportune moment can be decided only by a full review of the circumstances of the case, and in some instances it will be found that the new industry is capable of development far beyond the initial stages at which it is profitable, before the withdrawal of Government becomes imperative in the interests of those who have invested, or are anxious to invest, capital in the new industry.

"Demonstration."

Further, a Government factory which has successfully passed through the pioneer stage will often prove a useful training ground, both for the men who are to control the industry in the future and the workmen who are to be engaged in it. This leads us to consider the suggestion made by some witnesses, that Local Governments should establish and manage what may be conveniently termed "demonstration factories." The objects might be either educational, in which case these factories would serve as schools for the training of men as operatives, foremen or managers, under strictly commercial conditions; or, in other cases, the primary idea would be to show how to improve local industrial practice. As examples of the first, we may cite a glass factory, in which the training of operatives would be the *raison d'etre* for its existence; of the second, a silk-reeling and throwing house to demonstrate the advantages of modern methods of operation on a factory scale, in comparison with

the existing indigenous cottage methods. These factories would be the counterpart in industries of the demonstration farms established by the Agricultural Department. In actual practice they would be required principally in connection with the development of cottage industries, and we allude elsewhere to their necessity as a part of the scheme for the training of hand-loom weavers. If the object with which each factory of this class is started be kept strictly in mind, there can be no doubt that, so long as it fulfils its primary function, it must prove useful and can in no sense be regarded as likely to interfere with the development of private enterprise.

Division of industries into "cottage," "small organised" and "large organised' industries.

206. Starting with this preliminary statement of our views regarding the attitude which should be adopted by Government in rendering assistance to industries, we may now indicate the different ways in which action can be taken and the various methods by which the machinery that we have proposed to create can be brought into direct contact with industries. We have now in India two industrial systems working side by side, covering respectively :—

(a) Industries carried on in the homes of the workers, which we have designated as "cottage industries." In these the scale of operations is small and there is but little organisation, so that they are, as a rule, capable of supplying only local needs.

(b) Organised industries carried on in workshops or factories, which vary in size from simple rural factories, carrying out a single operative process, to the big textile mills and engineering workshops, employing thousands of hands and possessed of a complete organisation both for manufacture and trade.

These organised industries may be subdivided into two classes. In the case of the first, the interests involved are mainly of a provincial character. In the case of the second, the industries have markets extending far beyond the boundaries of a single province or even of India, and their inception and management give rise to questions of inter-provincial or even international trade, which can best be handled by an imperial organisation. As examples of these two classes of organised industries, we may cite, as belonging to the first, engineering workshops, tanneries, sugar factories, rice mills, some textile mills, cement works, glass works, wood distillation plants, distilleries and breweries, and the majority of the miscellaneous workshops engaged mainly in manufacturing for a local market. In the second class will be included industries usually carried out on a very large scale and involving very high capital expenditure, such as "heavy" chemical works, iron and steel works, electro-metallurgical and electro-chemical works, ordnance factories, factories for the manufacture of explosives, and the larger metalliferous mines with their associated metallurgical works.

It will, we think, be obvious from the outset, that each of these systems will require separate treatment, and the manner in which they can be assisted will be most easily explained by a reference to examples which have come to our notice.

Help to cottage industries.

207. As regards cottage industries we need add but little to our remarks in Chapter XVII. The workers are usually uneducated and without a knowledge of anything regarding their trade, except what can be acquired locally. Their lack of education denies them access even to the most elementary technical literature, and they can be influenced only by ocular demonstrations in their own neighbourhood. Had the activities of the Agricultural Department been confined to laboratory experiments or pot cultures, they would have had but little influence on the cultivators of the country. We found in Madras that the hand-loom weavers had been greatly influenced by the peripatetic weaving parties which are at work there, and useful results have been obtained in Mysore by sending round a skilled blacksmith and his assistant, provided with suitable tools, to teach the village artisans improved methods of smithery. Owing to their lack of contact with the outside world, new ideas do not readily occur to these small workers, and they can receive material help from the supply of new patterns and designs, an example of which we saw at the Amarapura Weaving School near Mandalay, where the popularity of the school was almost entirely due to the new designs introduced by the Superintendent. Much useful work can be done by bringing to the notice of artisans labour-saving devices, or even such complex pieces of mechanism as the jacquard machines for weaving intricate patterns on hand-looms. The processes employed by metal workers are especially susceptible of improvement in this way. In most parts of the country they are ignorant of the use of patterns for casting work and of the advantages of stamping, pressing and spinning metal. Where considerable colonies of these artisans exist, their status can be raised and their output greatly increased by the establishment of small auxiliary factories employing machinery to carry out operations which involve much time and labour when carried out by hand. These may be started by private individuals, by Government, or by co-operation among the artisans themselves, assisted by Government. Some attempts in this direction, we found, had been made in Madras, Nagpur and the United Provinces; but equipment was lacking and the attempts were not properly carried through. The extent to which co-operative working can be introduced among artisans has not yet been investigated, and we have alluded to this subject in Chapter XVIII. In towns and cities where there is a public electric supply, the use of electro-motors for driving small machines has been but very slightly encouraged. We have not the least doubt that they will ultimately prove most helpful to the artisan and will greatly facilitate the introduction of a more organised system of production. Finally, we have to draw attention to the urgent necessity for introducing better methods of marketing the outturn of cottage industries. In this matter it would

appear that Japan has been singularly successful, and we have gathered evidence to show that it is only the initial difficulties connected with the organisation of such work, that have debarred India from participating in similar advantages.

Help to large organised industries.

208. In the case of the existing larger organised industries, there will seldom be any call for technical assistance, as they are under the control of competent experts, who will only look to Government to conduct scientific researches and to provide accurate economic data, including such information as it will be the duty of the Commercial and Industrial Intelligence Department to supply. In the inception of industries of this class which are new to India or to a particular area, Government can render much assistance, both by way of conducting preliminary investigations regarding the raw materials available, the conditions under which the industry may be carried on, and the markets open to its products, and by the supply of technical advice in regard to the location of the factories, the design of the buildings, the arrangements for water supply and the selection of the machinery to be employed. To carry out this work, the services of industrial experts, who would be mainly mechanical engineers with special industrial experience, would be necessary; and the imperial scientific services would be drawn upon to provide the more highly specialised forms of scientific and technical assistance. Preliminary enquiries will frequently involve the examination of raw materials by an analytical chemist, and, in each province, there would be required at least one man drawn from the Indian Chemical Service, with a staff of assistants and a properly equipped laboratory, to deal with this work and to advise on ordinary local questions such as the quality of the water supply, the calorific value of the fuels available and the disposal of refuse.

Help to small organised industries.

209. We have already emphasised the importance of small organised industrial undertakings, and have explained the difficulties which confront them and the reasons why they have so largely failed to attract support. The Indian industrialist operating on a small scale frequently embarks on a venture, being imperfectly acquainted with the nature of the business, and, at the very outset, handicaps himself by laying out his limited capital on unsuitable plant and machinery. There are no consultants to whom he can go for advice, and usually he copies blindly what he has seen working somewhere else. It is desirable to provide competent technical assistance for such a man. To furnish some idea of the scope and variety of work in this direction which a Local Government may properly undertake, we have tabulated at the end of this chapter the technical assistance which may be rendered to industries, provided the Department of Industries is equipped with a suitable staff, many of the members of which would be drawn from the imperial services which we propose.

210. It is obvious from an examination of this table of industries that a considerable number of experts are necessary to advise what should be done, if each undertaking is to start under favourable conditions in respect of plant and of methods of working. It cannot be too strongly emphasised that in a country like India, where a very high return is expected on capital, every possible care should be taken over the preliminary enquiries and in the preparation of the plans, to secure the highest degree of efficiency compatible with the conditions of working. The saving of labour is not always a matter of importance, and it often happens that nothing is to be gained by the adoption of absolutely automatic plant; but, on the other hand, it is essential that the efficiency of processes of conversion or extraction should be as complete as possible, and that there should be no avoidable waste of raw materials or accumulation of useless by-products. Many of the failures of the past have been due to neglect of these important matters.

Initiation of small industrial undertakings.

An experienced Director of Industries would have no difficulty in deciding what type of expert is required and at what stage he should be called in. For some industries the Imperial Government should retain such men in its service, who would be deputed to assist provincial undertakings whenever necessary. Occasionally, the matter in hand may necessitate the engagement of experts to deal with particular problems; but, as has been already said, the majority of cases will simply involve the introduction into India of the most advanced practice in Europe or America. Such knowledge is usually in the possession of firms who have taken up the manufacture of the plant required, and the expert advice can be obtained by calling for tenders to comply with specified conditions. The staff of the Local Government must be in a position to prepare the specifications and be capable of determining whether the tender submitted complies therewith satisfactorily. Where considerable preliminary research is necessary, or where the raw materials have to be subjected to detailed examination, it may be anticipated that the officers attached to technological institutes will be able to render useful service, and, as these institutes develope, they may be expected to supply in India itself the class of men who will ultimately become specialists in the various branches and ramifications of technology.

211. In addition to rendering assistance in the starting of new industrial undertakings, extremely useful work can be done by Government for many years to come, in helping the owners and managers of small power plants to maintain them in good working condition. We were particularly struck with what has been done in this direction in the Madras Presidency in respect of the numerous small pumping installations, rice mills and other power plants which have been installed in recent years, chiefly by reason of the assistance given through the local Department of Industries. The necessity for this kind of assistance in a country like India, where the use of machinery is so little

Maintenance of small industrial undertakings.

developed, becomes the more apparent, when we remember that even in England, the owners of steam boilers established sixty years ago, and have voluntarily maintained ever since, what is known as the Manchester Steam Users' Association, whose object is, by competent and scientific inspection of steam plants, to prevent boiler explosions. What is found so useful in England in respect of part of the equipment of a factory as to be carried on by a private association, will be found of great advantage in India in respect of the whole equipment.

Industries of national importance.

212. In our chapter on the industrial deficiencies of India, we have given some account of the work which will have to be done to place India on a firm basis of economic self-sufficiency and of self-defence; and it is clear that, from this point of view, there are strong arguments for a policy of direct Government assistance in respect of essential new industries. We contemplate that only in exceptional circumstances will Government itself carry on industrial operations on a commercial scale; but it is necessary to establish and maintain Government factories for the manufacture of lethal munitions, and to exercise some degree of control over the private factories upon which dependence will be placed for the supply of military necessities. This, in most cases, could be obtained in return for guarantees to take over a definite proportion of the output, and should be exercised only to ensure that adequate provision is made to meet the prospective demands of the country in time of war. The methods which will have to be adopted to secure the establishment of such industries would naturally vary with the conditions under which each will have to be carried on. The degree and kind of aid which would have to be furnished, would largely depend upon the extent to which their productions can be disposed of through the ordinary channels of trade. In some instances, the conditions may be such that the expense of production will always exceed the cost at which articles of similar quality can be imported, and in such cases the industry can only be maintained by the grant of direct financial assistance or by the indirect operation of protective duties. In those industries which it is desirable to start and maintain on military grounds, the responsibility for action must lie entirely with the Imperial Government, who would naturally invite such assistance as Local Governments can usefully afford.

Besides industries essential to the safety of the country in time of war, we have mentioned others which will be of considerable economic importance and add to the industrial strength of the country in peace time. The natural resources of India are capable of furnishing the raw materials of many industries which do not now exist in the country; but knowledge regarding them is by no means complete, and there is no fund of accumulated experience. We have already explained, when dealing with the question of assistance by Government to the large organised industries, what forms this assistance may suitably take. The actual inception of these undertakings will usually

be a matter for private enterprise, and the necessary assistance can usually be afforded by the local Departments of Industries, with the help, in some instances, of imperial officers; but they will sometimes be of such importance to the country generally, and require the employment by Government of so costly and specialised an agency to work out the preliminary data, that it will be beyond the scope of any Local Government to do all that is needed. A potent means of aid in the case of industries producing articles required by Government would be guaranteed orders, and these can be arranged for on the fullest scale only by the Imperial Government.

Organisation required by Government to fulfil the above duties.

213. The foregoing description of the methods to be adopted by Government in assisting directly in industrial development will show the necessity of an extensive administrative machinery. Nearly every provincial Government has set about establishing a Department of Industries, and the bulk of the executive work will naturally fall to these departments, which should have at their heads experienced industrial experts. They will require in most of the provinces a large staff of officers with special qualifications. Those directly associated with organised industries would be men of scientific attainments, who have specialised in mechanical engineering with a view to its technological applications, whilst a staff of skilled and experienced craftsmen would be required for the assistance of cottage and minor industries. Already in Madras it has been found necessary to appoint district officers in places where industrial developments are proceeding apace, in order to provide for the efficient supervision of new undertakings, and to ensure prompt assistance to those in operation, whenever accidents occur or difficulties crop up that are beyond the capacity of the management. The volume of such duties is rapidly increasing, and may probably grow even faster under the stimulus of the measures which we propose in this report.

Functions of Imperial Government.

214. While we contemplate the utmost possible decentralisation we have shown that some share in the direct assistance to industries by the State will have to be taken by the Imperial Government. The exact line of demarcation will, to some extent, depend upon the degree of provincial autonomy accorded to local administrations; but it is obvious that the imperial department should exercise supervision over research work; that it should be responsible for the conduct of investigations of general interest to the greater part of India; that it should exercise control over Government factories and such industrial undertakings as are necessary in the interests of national safety, or the scope of which brings them outside the range of the equipment with which provincial Departments of Industries will ordinarily be provided, and, finally, that it should watch over provincial administrations in order to secure the maintenance of a uniform industrial policy.

Examples of industries that might be aided by provincial Departments of Industries.

Serial No.	Name of industry.	Technical help required to initiate.		Explanation.	In general charge of working after start.
		Scientific advisers.	Engineers and Experts.		
1	Saltpetre	Bacteriologist, Chemist.	Engineer (a)	(a) To specialise, design and advise as to factory plant.	Chemist.
2	Glass . .	Chemist, Mineralogist.	Group of glass specialists (b).	(b) *Vide* Appendix E.	Trained general glass expert.
3	Oil milling	Chemist . .	Engineer (a) Specialist (c)	(c) Different classes of oil seeds demand special knowledge in some cases.	Chemist.
4	Matches . .	..	Timber expert (d) Specialist (e) .	(d) Imperial Forest officer. (e) Will advise as to selection and working of plant.	Trained expert.
5	Flour and rice milling.	..	Engineer (a) .	..	Engineer.
6	Pumping plant.	Geologist. .	Engineer (a)	..	Mechanic.
7	Hand weaving	..	Weaving specialist.	..	Master weaver.
8	Tanning . .	Chemist for tanning materials.	Forest expert for materials. (d) Experts (f).	(f) Experts for raw materials and different kinds of leather.	Tanner.
9	Leather work .	..	Experts (subordinate).	Boots; saddlery and harness; trunks and bags.	Business man.
10	Fruit and fish canning.	Agricultural or fisheries experts. (g)	Canning specialist	(g) Will belong to the departments in question.	Expert.
11	Brass work . Lamp making.	..	Engineer (a) .	..	Mechanic.
12	Pottery . .	Mineralogist .	Engineer (a) . Experts for kiln making and ceramic manufacture.	..	Ceramic expert.
13	Soap making .	Chemist . .	Engineer	..	Chemist and Soap boiler.
14	Essential oils .	Do. . .	Distillation expert	..	Chemist.
15	Wood distillation.	Do. . .	Forest officer Engineer (a)	..	Do.
16	Dyeing . .	Dye chemist .	...	..	Do.

CHAPTER XV.

Miscellaneous Points of Government Law and Practice affecting Industries.

The Employment of Jail Labour.

Lack of policy.

215. In the past there has been much complaint by Chambers of Commerce and private firms about the unfair competition of jail industries, and regulations have been made to prevent their underselling private manufacturers in the open market. The question of suitable employment for prisoners in jails has never been properly examined in reference to its economic aspect, and no general policy has been framed for the guidance of jail departments. As a matter of fact, most provinces follow more or less the same lines; but apparently the work which is actually done in jails depends very largely upon the attitude of individual Jail Superintendents. Briefly, jail industries are necessary to keep prisoners employed, to recover as far as possible the cost of the upkeep of the jails by the sale of the products of their labour, and to teach them a trade by which they may earn an honest livelihood, when they are once more free men.

Nature of industries which should be adopted in jails.

216. In jail industries, only manual labour should, we consider, be allowed, and they should be so chosen that the labour put into the finished goods represents the major portion of the cost of production. The establishment of power factories inside jails and the extensive employment of machinery we regard as undesirable, and the complaints which we have received concerning the competition of the woollen mill in the Bhagalpur jail and the cotton mill in the Coimbatore jail are reasonable. We think it is desirable that the question of the employment of prisoners in jails should be considered by experts. A careful scrutiny of the requirements of Government departments would, we believe, show that jails could supply their needs to a much greater extent than has hitherto been done. There is an obvious tendency in jail administration to regard with favour the development of jail industries with a view to large receipts. The abuses to which this policy is liable might be counteracted by giving the provincial Directors of Industries and their advisory committees some voice in the matter, with power to make recommendations to the Local Government.

The trades at present carried on in jails by habitual criminals belong very largely to the type of cottage industries, with which their products

frequently compete. This seems in many ways undesirable; and furthermore it is almost unknown to find a man who has learnt such an industry under jail conditions practising it on return to liberty. If the hereditary carpet weaver understood what was going on, he would protest as emphatically against jail carpet factories as Chambers of Commerce have done against power cotton weaving in jails. As a matter of fact, his protest, though silent, is effective. He renders it impossible for a released prisoner, no matter how skilled he may be as a carpet weaver, to practise his trade, and one of the presumed objects of jail administration is thereby frustrated. Cottage industries are, moreover, comparatively light and pleasant occupations, and should be, though it is doubtful if they are in all cases, reserved for weakly prisoners. The above remarks do not, of course, refer to the inmates of reformatories or Borstal jails.

The Prevention of Adulteration.

217. We have examined with considerable care the arguments for and against legislation to prevent the adulteration of articles intended for local consumption and of produce for export. The case of foodstuffs for local consumption presents few difficulties, for public opinion is agreed that, so far as these are concerned, their adulteration should be punishable by law. In the United Provinces, an Act has been in force for some years penalising the adulteration of food and drugs, and legislation in other provinces is following similar lines. The adulteration of drugs is, however, much more difficult to deal with, and it is doubtful if legislation is likely to be very effective in this direction. The organisation for enforcing the existing Acts requires considerable strengthening; at present it exists only in certain municipal areas.

Food and Drugs.

218. As regards raw produce for export or local manufacture, the balance of commercial opinion is that legislation would not be likely to effect any improvement in the present state of things. There can be no doubt that the real remedy lies in the hands of the buyers. This has been clearly proved by the improvement in quality of Indian exports of wheat since the introduction of the 1907 wheat contract of the London Corn Trade Association on a basis of two per cent. admixture of other food grains, but free from dirt. This contract has, we believe, caused no trouble with sellers, and it appears to us that its provisions might be extended. Linseed and other oil seeds have also been shipped to the United Kingdom on pure basis contracts since 1913, with satisfactory results to all concerned, and a suggestion has been made that exports of oil seeds to other countries also should be similarly regulated. But we repeat that these are matters for arrangement between exporters and their buyers, and that the latter are in a position to insist upon freedom from adulteration if they really want it.

Raw produce.

Wheat.

Oil seeds.

In the case of jute, the question of legislation against adulteration has been frequently and thoroughly discussed within recent years, and a bill was actually drafted by the Bengal Government in 1916, but was dropped owing to the general commercial opinion, which Government appears to have shared, that in practice it would prove inoperative and unworkable. It is perhaps possible that the act of watering jute might be made a penal offence, but it would be a very difficult one to prove, as jute is naturally wet after steeping, and the matter may safely be left to the mills and the shippers, who will not buy wet jute from fear of "heart damage."

Jute.

Similarly, it has been suggested that the actual watering of cotton might be made a penal offence, and again that the licensing of gins would probably have a deterrent effect upon adulteration. This latter proposal appears to us worth consideration, but we prefer to express no definite opinion regarding the adulteration of cotton, in view of enquiries which have been made by the expert Cotton Committee, recently appointed by Government to consider as a whole the many problems relating to this industry.

Cotton.

219. An important witness in Calcutta stated to us that business in produce would be greatly facilitated, if Government certificates of quality and weight were enforced upon shippers and buyers; but when we consulted the Bengal Chamber of Commerce regarding his proposals, which they in turn referred to their membership generally, we found that the bulk of commercial opinion regarded them as wholly impracticable and unnecessary. In any case, we do not see how buyers abroad could be compelled to accept such certificates.

Certificates of quality.

We consider, however, that Government should do what it can to strengthen the hands of the recognised associations which are affiliated to the various Chambers of Commerce, and should give ready consideration to any practicable proposals put forward by them, whether designed to prevent adulteration of produce or to stimulate improved production.

220. But we would make one exception to what we have written above, with reference to the trade in fertilisers. There are at present in India no laws to prevent a dealer from selling as a fertiliser anything that he may choose so to describe, nor are there any legal standards or percentages of error in description. In Great Britain, the Fertilisers and Feeding Stuffs Act of 1906 compels sellers to describe and certify their wares; it also empowers the Board of Agriculture to fix percentages of error for certain ingredients of both feeding stuffs and fertilisers. We consider that an Act on similar lines should be introduced into India, and we understand that it would be welcomed both by the trade and by the public.

Fertilisers.

The Administration of the Boiler and Prime-Mover Acts.

221. With reference to the administration of the various provincial Boiler and Prime-Mover Acts, there is a great diversity of practice all over India, which causes trouble to persons who purchase boilers from other parts of India or desire to employ engineers who hold certificates from other provinces. We have enquired closely into the question of the certification of engineers and boiler attendants. We do not find that in provinces where certification is required, engineers are better qualified or accidents less frequent than in those where this is not the case. It is urged that these certificates are to some extent a guarantee to owners of small industrial plants of the competence of applicants for employment. We do not attach much importance to this argument, and it will have still less weight if owners and employers have the advice of a local Department of Industries to help them. On the other hand, it is undoubtedly the case that the possession of a certificate gives a fictitious value to its holder, and makes it more expensive to employ him on small installations. It is true that certain educational institutions owe many of their pupils to the fact that they prepare them for boiler certificate examinations, but this is beside the point. The demand for qualified engineers is greatly on the increase, and a better class of man than the mere 'engine driver' must be provided for the larger organised industries.

Diversity of practice in various provinces.

Accidents are usually due either to carelessness, or to defects in the plant. When due to ignorance, which is seldom, they are likely to occur during the absence of the responsible attendant, a possibility that is at least as great in provinces which insist on certificates as in those which do not. It must also be remembered that at present the law does not apply to the case of internal combustion engines, which are not less liable to accidents in their way than steam engines.

222. The Boiler Inspection Department is considered at length in the report of the Public Services Commission (page 126). The Commissioners lay down four principles for general guidance :—

Recommendations of the Commission.

"In the first place, the time has come to make the boiler inspectors Government servants in every respect, like the factory inspectors, and to pay from general revenues both their salaries and their pensions, irrespective of the amount of fees earned. Secondly, expert supervision of the inspecting staff is essential. Police officers and members of the Indian civil service do not possess the necessary technical qualifications. Thirdly, the present system, by which in certain places representatives of the interests to be inspected have a voice in the management of the inspection department, is unsound, and should be abolished. Fourthly and finally, there should be one officer in each of the larger provinces who should be responsible for the effective working of the inspection staff. He should be called either a chief or first inspector according as the work to be done is on a large or small scale."

We endorse these recommendations, and would add the following :—

(1) Boiler inspection should be a duty of the provincial Departments of Industries.

(2) The Imperial Department of Industries should draw up a series of technical rules for the guidance of inspectors in determining the pressure for which a boiler may be licensed throughout India, and should bring and maintain these rules up to date in a form applicable to the various modern types of boilers.

(3) The laws compelling persons in charge of boilers to possess certificates should be abolished.

The second and third of these proposals would involve legislation.

The Mining Rules.

Criticisms of existing rules.

223. A considerable amount of evidence was forthcoming regarding the suitability of the rules under which mining concessions are at present granted by Government. Our conclusions are that the rules have, except in a few comparatively minor respects, stood the test of working admirably and that the criticisms received were mostly shown, on discussion with witnesses, to be due to misunderstanding of the effect of the existing rules, or to failure to realise the difficulties which would arise from adoption of the alternatives suggested.

There are, however, certain matters connected with the working of the rules on which we desire to put forward our suggestions. We recorded a considerable amount of evidence regarding the injury to the mineral possibilities of the country caused by wasteful methods of working; and it was suggested that small mine owners would be greatly benefited by the advice of Government mining engineers. Some witnesses even considered that these officers should have power to compel mine owners to follow their advice. The main objection to this course is the danger of loss to a manager forced to follow official advice regarding the development of his mine. In some countries, royalty owners are interested in seeing that their properties are economically worked. In India, unfortunately, private royalty owners do nothing of the kind; indeed, in some cases they insert conditions in their leases which directly tend to cause wasteful working. Whether or not any general steps should be taken at this stage to ensure the economical working of privately owned minerals, it certainly behoves Government to secure this end in the case of its own properties. We have also considered the proposal that Government should insist on concession holders employing qualified mining engineers; but, while we recognise that there is much to be said for such a course, we feel that hardship would be caused to poor concessionaires, unless provision was made for exempting small or easily worked deposits.

Increased staff to inspect Government concessions recommended.

224. We would, therefore, only recommend at present that a suitable staff be entertained in connection with the Geological Survey Department to inspect Government concessions. The experience gained in a few years by such a staff would show how

far it would be possible to insist on all Government concessions being worked by qualified men, and the extent to which small concessionaires may be benefited by the advice of Government mining engineers.

The existence of such an inspecting staff would admit of more elasticity in the terms of prospecting licenses, alike in respect of area, length of currency and rental. If Government were in a position to satisfy itself by expert inspection, that a proper amount of development work was being done, it might, in the case of a property requiring heavy expenditure in its initial stages, grant a more extensive area on a prospecting license for a comparatively long period. It would be unnecessary to burden the enterprise with a high acreage payment, when the Government inspecting staff could ensure that a proper amount of development work was being done. This proposal would, we think, meet the difficulty at present experienced by concessionaires where extensive operations for the proving of mineral values are required, as for example, boring for oil or for minerals occurring at uncertain intervals on a known geological horizon. The Mining Rules provide for the renewal of prospecting licenses under the authority of the Collector up to a period of three years. The rules are silent as to the power to give further renewals, which is presumably reserved for the Government of India. We think that, with the help of the system of inspection which we have proposed Local Governments might be authorised to grant extensions in such cases up to a maximum period of five years.

It will be noticed that this system of inspection would entail a substantial increase in the staff of the Geological Survey. Several witnesses of undoubted authority drew our attention to its inadequacy, and they hesitated to make proposals for useful forms of Government assistance to the mineral industry, only because they assumed that the cadre was fixed. In view of the national importance of minerals and of the act that inefficient working destroys for ever the value of a deposit that might in future be of vital importance, we consider that the additional expense incurred in such an increase would be an investment that Government can undertake with absolute confidence.

Simplification of mining leases proposed.

225. In view of the constant changes in mining methods and development, we think that the present form of mining lease might be considerably shortened and simplified, leaving certain matters specified in the lease to be dealt with by rules made from time to time; such rules might be suggested by, and should in any case be submitted for criticism in advance to, local committees of private mine owners presided over by a Government official. The present system of trying to provide for every possible contingency by an elaborate lease must result in undesirable rigidity, while not securing for Government the degree of control desirable. Further than this, concessionaires, in the case of small alluvial and other obviously short-lived deposits, would probably be glad to accept short-term mining leases on simple conditions and free of multifarious restrictions.

226. There were many complaints of the difficulties experienced by mineral prospectors or mine owners in areas where the mineral rights were in the hands of private land owners ; these mainly had reference to the great subdivision of proprietorship or to the obscurity of titles. These difficulties are similar to those experienced by all investors who desire to acquire property in such areas, and we see no reason for making any recommendation regarding the registration of titles, or the compulsory acquisition of surface rights where Government does not own the minerals, except in the possible case of a mineral which is essential for national purposes, and of which only a very limited quantity exists.

Difficulties in acquiring mineral rights.

227. Other complaints by witnesses had reference to local rules governing the working of special minerals, and the grant of licenses and leases of minerals outside the scope of the Mining Rules. Would-be concessionaires said that they experienced difficulty owing to the diversity of rules and practice as between one province and another, especially in respect of minerals like limestone, which are now required for large organised industries, such as iron smelting ; and generally from the lack of any complete and readily accessible compendium of the local rules. We think that, in provinces where there is considerable mining activity, it is advisable for Local Governments to issue Mining Manuals similar to those published in the Central Provinces and Burma. These should include the Government of India Mining Rules, the local supplementary regulations, and any other provisions of rule or law that are likely to be encountered in the course of their work by persons engaged in mining. We suggest that these manuals would be of increased value if they contained notes prepared by the Geological Survey Department on the known mineral resources of the province and references to publications containing more detailed information.

Mining Manuals might be prepared in certain provinces.

We received also a quantity of evidence regarding certain local difficulties which have arisen in special cases, *e.g.*, in the case of mica mining in Bihar and Orissa. These involve no change in the Mining Rules, and will doubtless be considered by the Local Governments concerned.

The Administration of the Electricity Act.

228. A matter of considerable importance which may be conveniently discussed here, is the working of the Indian Electricity Act regulating the supply and use of electrical energy. There are now numbers of electric supply companies which provide electrical energy for domestic consumption, for industrial purposes and for public use. Although only one or two witnesses came before us whose position entitled them to give evidence on these matters, we were furnished with both information and criticisms by the representatives of the Electric Supply and

Administration of law and rules.

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Traction Federation of India. Considering the magnitude of the interests involved and the novelty of public electric supply, there was comparatively little complaint regarding the administration of the rules framed under the Act. It was, however, brought to our notice that in some provinces the professional qualifications and experience of the Electric Inspectors did not command the confidence of the managers of the larger local undertakings. The principal criticisms were that the rules were too rigidly worked, that they were sometimes wrongly interpreted, and that there was an unwillingness on the part of the Inspectors to assume the responsibility of relaxing the rules in cases which obviously demanded it. To remedy matters, it was suggested to us that men of higher professional status and with practical and commercial experience of electric supply undertakings should be appointed as Inspectors, and that an imperial Advisory Board should be established to advise Local Governments with regard to appeals from the decisions of their Electric Inspectors. We support the former suggestion strongly, but it appears to us that the appointment of provincial Advisory Boards, as contemplated in section 35 of the Act, will meet the needs of the case, especially if these Boards are permitted, when necessary, to consult experts such as the Electrical Adviser to the Government of India. We consider it extremely desirable that Government should encourage the industrial use of electricity supplied from central generating stations. It was represented to us that section 23 of the Act did not allow a licensee under the Act to discriminate in respect of his charges between the domestic and the industrial uses of electrical energy. We are not sure if this interpretation is correct, but if so, the section would seem to require amendment. Without entering into technical details, we may state that we agree with the contention that the load factor should be taken into account in fixing the charges. In congested cities, and particularly in Calcutta where the smoke nuisance is greatly aggravated by the numerous small steam plants set up to drive rice and oil mills, it is essential that no obstacles should be created to the introduction of electrical power for industries. It appears to us that the economies which can be effected by the use of energy from public electric supplies, when reasonable rates are charged, are not yet sufficiently appreciated.

Electric Inspectors should be transferred to the Department of Industries.

229. The Electric Inspectors are attached to the Public Works Department, an arrangement probably made at the outset because that department is concerned with engineering; but, as the interests to be safeguarded are mainly industrial and commercial, we think it would be more convenient to transfer them to the Departments of Industries. So far as the technical aspect of the administration of the Act is concerned, these departments are also likely to be better equipped to deal with it. The transfer of the administration of the Act to the Department of Industries would render desirable an amendment of section 53 (1) (*a*) of the Act.

Patents.

230. India is not a member of the International Convention, and in this respect stands in a different position from most of the British dominions. The subject was discussed at the time of the passing of the Patent Act of 1911, but the refusal of India to register trade marks precluded her from joining the Convention. Any person who has applied for a patent in a country which is a member of the International Convention is entitled to protection in priority to other applicants in all other States of the Union, if he applies within one year from the date of his first application. An Indian inventor secures no such protection. On the other hand, a foreign inventor desiring to obtain protection in India must apply for patent in India before publication in India, and is protected from the date of his application in India. Some witnesses have represented that Indian inventors are at a disadvantage on this account, but, though this possibly may be true in rare instances, the country generally is not. The number of patents applied for in respect of inventions originating in India is very small compared with that in respect of foreign inventions, and a much larger proportion of the patents granted in this country to local inventors are allowed to lapse as being of no value.

From 1893 to 1915 inclusive, the annual average number of applications for patents in India was—

From Indians	53
From other residents in India	135
From foreigners	360
TOTAL	548

It would, therefore, appear that it is more to the advantage of India to avoid the acquisition of rights in India by foreign inventors than for Indian or Anglo-Indian inventors to obtain such rights elsewhere. Undoubtedly the majority of Indian patents are acquired for the purpose of preventing unlicensed import into India of articles patented abroad. The grant of such patents is obviously in many respects to the advantage of India, and the interest of the user and of the intending manufacturer in India are sufficiently protected if the law adequately provides for compulsory licenses or revocation in case where the reasonable requirements of the public are not satisfied or where the patent is worked outside British India. The provisions of the existing Act in these respects appear to be sufficient, and the Indian patent law seems to be well suited to the needs of the country.

On the other hand, there is a growing body of opinion that it is desirable to consolidate the patent law throughout the British Empire, and, if this developes further, it will be a question whether India would not derive greater advantage from uniformity with other British dominions than she enjoys in her present somewhat isolated position. The number of applications shown in the records of the Indian Patent Office

is still small, the totals in 1912 and 1913 being 678 and 705, respectively, of which 508 were of foreign origin in each year. The fees for the grant and renewal of patents are much less than in the United Kingdom. Thus in India, the initial fee is Rs. 40, in the United Kingdom £5; and the total cost of protection for 14 years in India is Rs. 790, and in the United Kingdom £100.

Registration of Trade Marks.

231. The subject of the registration of trade marks was brought before us once or twice, but was never strongly pressed. On the not infrequent occasions when the subject has been discussed departmentally and by Chambers of Commerce, it has been generally considered that registration of trade marks, as it exists in the United Kingdom and in many other countries, is not desirable in India, though the Burma Chamber of Commerce put forward the opinion that legislation is necessary.

We have given very careful consideration to the arguments used, and agree with the majority of the Chambers of Commerce in considering that the establishment of a system of registration would seriously disturb existing rights of user both between firms in India and, if full advantage of the proposal is to be obtained, between firms in India and firms abroad. The difficulties so created would be far greater in our opinion than the slight inconveniences experienced by owners of marks in maintaining their rights thereto.

Registration of Partnerships.

Obstacles in the way of legislation.

232. The vexed question whether registration of partnerships should be made compulsory has been many times under the consideration of the Government of India within the past 50 years. The last occasion was in 1908, when the Bengal and Bombay Chambers of Commerce both prepared draft bills dealing with the subject; but their drafts were irreconcilable, and Government considered that the proposals did not afford a basis for legislation.

During our tour we recorded the opinions of many witnesses on the subject; most of them favoured compulsory registration, should it prove to be practicable, but some, especially amongst our Indian witnesses, feared that the prevalence in Indian businesses of the Hindu joint family system would be found an insuperable obstacle. Mr. B. L. Mitter, a leading barrister of the Calcutta High Court, has made some valuable suggestions* which, we think should go some way to remove this difficulty; these he developed further when he appeared before us to give oral evidence in support of his written statement, and he also gave us to understand that the leaders of the Calcutta Bar generally were in substantial agreement with his views. Mr. Mitter's

* Minutes of Evidence—Vol. V.

proposals practically treat a Hindu joint family as a single partner, and provide for the compulsory registration of all contractual partnerships. So long as the business is a purely joint family business, with no stranger in it, registration would not be necessary, but directly a stranger is introduced into the business, the partnership would become contractual, the contracting parties being the joint family as a unit on the one side, and the stranger on the other. Registration would then become necessary, and the joint family would be registered in the name of the *karta* or head of it, whose declaration would bind all the family. Mr. Mitter considers that registration should be made compulsory in the case of future partnerships only, and would leave to existing concerns the option of registering or not as they may desire, his argument being that, as all partnerships have to be renewed when the terms are changed, or a partner dies, compulsory registration would become universal within a generation.

The other chief obstacles in the past to the introduction of compulsory registration have been, first, the difficulty of excluding, and the hardship of including, small partnerships, of which there must be many thousands among petty shop-keepers and traders in all parts of the country, and, second, the difficulty of applying registration to transitory or single-venture partnerships, which are said to be common on the Bombay side. We see no reason why either small or single-venture partnerships should be exempted from the provisions of any legislation that may be found practicable; for to the former the analogy of custom in petty transactions in land would apply, and, as Mr. Mitter points out, these are habitually registered without any trouble and at a very trifling cost; and the latter should be, and are, governed by the law which regulates partnerships. To meet in part these suggested difficulties, it has been proposed that a compulsory Registration Act, if introduced, should run at first in the Presidency towns only; but we see no need for this restriction.

Recommendations of the Commission.

233. Looking at the matter in its purely business aspect, it appears to us that throughout the main stumbling-block in the way of compulsory registration has been the Hindu joint family system, and that the difficulties in this regard would to a great extent disappear, if Mr. Mitter's proposals were adopted; they have at any rate the two great advantages that a joint family can be registered as a single entity, and that it would be difficult for a person to deceive third parties by pretending that he was a partner, when in fact he was not or *vice versâ*. We, therefore, consider that Government should take an early opportunity of examining the whole question thoroughly with a view to legislation, and in so doing should invoke the assistance of the leading non-official lawyers in the chief business centres; for we believe that few among minor measures would do more to develope confidence and promote business relationship between Indian firms and their constituents abroad, and especially between European and Indian firms in this country.

We do not consider any system of optional registration in the least likely to achieve the desired results.

Registration of Business Names.

234. It has been urged upon us in some quarters, especially by Trades Associations, whose members have probably suffered most from the absence of it, that we should recommend legislation on the same lines as that recently enacted in the United Kingdom under war conditions, to enforce the registration of business names. This is, however, a question on which comparatively little evidence has been forthcoming, and we do not, therefore, feel justified in making any recommendation.

CHAPTER XVI.

The Welfare of Factory Labour.

Nature of problem.

235. Indian labour in organised industries is much less efficient than the corresponding classes of labour in western countries; and there is evidence to show that in many cases it does not produce as cheaply as western labour in spite of its lower wages. It is true that inferior physique and tropical conditions contribute to this state of affairs; but there is grave reason to believe that the former is to some extent the result of preventible disease, whilst other causes, which are even more obviously remediable, are factors that unnecessarily increase the difficulties of our labour problem.

All authorities who are qualified to speak on the subject agree that Indian labour is content with a very low standard of comfort. This secured, the Indian workman, speaking generally, takes advantage of the greater earning power given to him by increased wages to do less work, and shows no desire to earn more money by working more regularly or by improving his own efficiency. In the case of Bombay, witnesses have stated that since the ten per cent. rise in the wages of mill operatives given during the rains of 1917, there has been an actual falling off in output.

236. There is substantial agreement between the best informed witnesses that the remedies for this state of affairs are a rise in the standard of comfort and an improvement in public health. These ends can be attained only by education, improved housing and a general policy of betterment, in which an organisation for the care of public health must play a prominent part. If the children of workers are provided with education under tolerable conditions of life, a new generation of workers will grow up, who will learn to regard mill work as their fixed occupation. Better housing is a most urgent necessity, especially in the large congested industrial cities. Facilities for healthy amusement, shorter hours of work (though a reduction of these may for a time decrease output), and other measures for economic betterment, such as cheap shops for the sale of articles required by the mill hands, and co-operative societies, are almost equally important. The conditions under which industrial operatives live and work in this country ought, if efficiency be aimed at, to approximate, as nearly as circumstances permit, to those of temperate climates. Continuous factory work in the tropics is, at certain seasons of the year, far more trying than similar work in northern countries. The needs of domestic sanitation in large towns are more pressing. The problem, not only on moral grounds, but also for

economic reasons, must be solved with the least avoidable delay, if the existing and future industries of India are to hold their own against the ever-growing competition, which will be still fiercer after the war. No industrial edifice can be permanent, which is built on such unsound foundations as those afforded by Indian labour under its present conditions.

On the other hand, the margin which the efficiency of the Indian mill hand leaves for improvement is so great that, if the problem be successfully solved, the advantage to Indian industry should be very marked.

Education of factory children.

237. The question of the education of children employed in factories was under the consideration of the Government of India between the years 1915 and 1917. Children between the ages of 9 and 14, generally known as half-timers, are employed in mills for six hours a day, and the Bombay Government proposed, after discussion with representatives of the mill-owners, to take powers, by rules under the Factories Act, to split the shift into two three-hour periods, and to compel factory owners to provide educational facilities for children in the interval. The proposal was criticised extensively on the ground that children might be induced by their parents or by jobbers to work in the mill itself between the shifts, a practice which it would be very difficult for inspectors to prevent, and because it was doubted whether a system which involved retaining the children in the mill compound for nine hours, even if three of them were to be passed in the mill school, was in itself desirable. The Buckingham and Carnatic Mills in Madras, it may be noted, keep to the six-hours shift, and educate those of the children who choose to come to school, after the earlier and before the later shift, the whole of the children working in the mill being employed in two six-hour shifts. This voluntary system has been a success, and has attracted a large proportion of the children employed. But the labour in these mills is not recruited by contractors; there are practically no rival mills in the neighbourhood; the workers are exceptionally well controlled, and special arrangements are made for the comfort of the children. It is too much to hope that, where these conditions do not exist, the same results will be attained.

But an indirect method, such as splitting the shifts, or indeed any procedure by way of amendment of the Factories Act, seems to us illogical. The first thing to do is to introduce compulsory education in areas where this is feasible, applicable to all classes of children and not merely to those employed in factories. Any consequential amendment of the Factories Act may then be considered. We note that in December 1917 an Act was passed by the Bombay Legislative Council, empowering municipalities (other than that of Bombay) to declare the education of children between the ages of 6 and 11 years compulsory subject to certain safeguards, and to raise funds to meet the necessary expenditure. In the debate on the bill, the effect of the proposed legislation on the employment of children, especially in factories, was discussed; and the conclusion reached was embodied in section 11 of the Act. This has

the result of leaving it to be decided, in the first place by the school committee and in the next by the magistrate before whom a case is brought, whether the employment of a child is of such a nature as to interfere with its efficient instruction. The working of the Act will doubtless show whether any further and more direct form of restriction on the employment of children in factories or elsewhere is desirable.

Conditions of housing industrial labour in India.

238. In considering the important question of the housing of workmen, we find widely different conditions prevailing in various parts of the country. Where factories have been established at a distance from towns, the labourers are often housed in surrounding villages in much the same way as agricultural labour. In such cases employers have often found it impossible to obtain labour without providing accommodation. The dwellings take the form of single-storey lines, consisting of single-room units, with either a verandah or, in some cases, a small enclosed courtyard. Here conditions approximate to those of ordinary village life, except that as a rule the small garden plot owned by villagers in many parts of India is absent. Such conditions are satisfactory, provided that the employers enforce a few simple rules, furnish a small sanitary staff for scavenging purposes, and supervise closely the disposal of excreta and the supply of drinking water.

The next stage of development, and consequently of congestion, is exemplified in cities such as Madras, Cawnpore, Nagpur and Ahmedabad and in a very large proportion of the industrial areas round Calcutta. Here land is far cheaper than in the cities of Calcutta and Bombay, and accommodation usually consists of single-storey huts in groups known as *bustis*, erected by persons other than the owners of the mill and rented by mill hands on fairly reasonable terms. In Rangoon and other parts of Burma seen by us, adult male labourers are accommodated free of rent in large barrack rooms, holding 10, 20 or 30 men each. In all these cases there is less comfort of the kind to which the villager is accustomed, and sanitation is more difficult and requires close supervision, whether by the mill-owner or by the local authority. Even here, the more enlightened factory owner has found it advisable to provide accommodation on an increasing scale, recognising that, though the rent which he can obtain will not pay him more than a trifling percentage on his outlay, the mill which houses its labourers best will command the pick of the labour market, especially in the case of such a fluid labour force as that on which the textile factories rely. Two of the large European factories in Cawnpore, two cotton mills in Bombay, and several jute mills near Calcutta have followed this policy. The last-mentioned are providing housing for an appreciable portion of their labour, either free or at a rate much below the economic rent. The accommodation is usually of the single-storey, or at the worst of the double-storey type, and is almost invariably in single-room units. These rooms are readily taken up by the labourers, who apparently find no objection to renting them from their employers. In Ahmedabad there is a distinct movement in the same direction. In this class of areas there are two reasons

which have encouraged employers to provide accommodation for their labourers. Land is cheap relatively to its cost in the cities, and the mills have usually provided themselves in the first instance with large compounds, or, if this is not the case, no prohibitive expense is likely to be entailed in acquiring sufficient site-room. In the next place, the mills are not, as a rule, so closely grouped together that labourers accommodated in buildings belonging to one mill find it easy to go and work in another. Thus, the employer who incurs expenditure in housing his labour can be reasonably sure, in most cases, that that labour will continue to work in his mill; in Bombay this does not hold good, as will be seen later. Those employers who are sufficiently enlightened to provide housing for their workmen employ expert advice as a rule, and are ready enough to consider recent ideas in regard to the design and lay-out of industrial dwellings.

General proposals regarding housing of industrial labour.

239. Great difficulty, however, is experienced in some cases in obtaining a clear title to the land and in coming to terms with the numerous small interests held therein by various classes of individual owners and tenants. We have indicated the difficulties that exist and our proposals for meeting them in Chapter XIII but, as there indicated, we would go further in the case of land required *bonâ fide* for the housing of labour, than in that of sites for directly profit-making industrial purposes. In the former case, under certain conditions, we would support compulsory acquisition, at the expense of the employer as a general rule, provided that it is clearly proved to the satisfaction of Government that the proposed area is the most suitable that can be obtained, having regard to any interests of importance that may be affected by acquisition. Due safeguards must, of course, be provided against the conversion of the land to other uses without the consent of Government, and the buildings to be erected must be of a type approved by the local sanitary authorities. We propose also an alternative form of assistance where it is desirable to accelerate unduly slow progress in housing or to avert threatened congestion. The land might be acquired at the cost of Government or of the local authorities concerned and leased by them to the employer, either at a rate which will pay off its cost over a term of years and leave it the property of the employer, or on ordinary long leasehold terms. The land in such cases will afford ample security for the outlay. Local authorities should also be encouraged, or, where necessary, created, to ensure the development and lay-out of growing industrial areas on suitable lines, as well as to supervise sanitation. This will greatly assist employers, who can only exercise authority in this respect over the land in their own possession and often experience serious trouble owing to the condition prevailing in adjoining areas. The outbreak of plague or cholera in an unregulated *busti* adjoining a carefully managed and laid-out settlement is a most serious menace to the settlement itself. Local authorities should also be given power to declare that certain areas may be closed to industries, either generally or of particular kinds.

Special Proposals for Bombay.

Necessity for special action in case of Bombay City.

240. We should have considered the above recommendations, together with those in Chapter XIII sufficient to meet the situation throughout India generally, assuming that the various local authorities follow the policy of improving sanitation and housing in congested quarters, and take care that adequate space is laid out, or, where necessary, acquired beforehand, for industrial areas. But in the case of Bombay the existing congestion and the difficulties in the way of betterment are unique in India, and, though many proposals have been considered for dealing with them, no really practical steps have so far been taken, and special measures are obviously needed. We propose to deal at some length with the position in this city, both for the above reasons, and because Bombay is only, after all, an example of what continued neglect may produce elsewhere, though perhaps not on such an aggravated scale. Difficulties of a similar nature are beginning to make their appearance in other cities, *e.g.*, Calcutta and Cawnpore, and the principles which we shall endeavour to lay down and the measures which we shall propose in the case of Bombay will serve to some extent as amplifications of our foregoing proposals, for adoption elsewhere if necessary.

In our description of Bombay in Chapter II, we have given an account of the labouring classes, the sources from which they are recruited, and the nature of their employment. We may, however, draw attention to the fact that mill operatives do not by any means constitute the entire labouring population of Bombay. Dock and godown labourers, employés of the railways and public bodies, and cooly labour generally live under precisely the same conditions, and it would be unfair and useless to confine our discussion solely to the textile operatives.

Conditions under which labour is housed in Bombay City.

241. Much has been written about the housing of the Bombay labourer, and, though the worst is very bad, it is necessary to point out that there has been a good deal of exaggeration of the extent of the overcrowding and of the proportion which the buildings of the worst type bear to the total number. We visited a number of workmen's dwellings, usually known as chawls, under the guidance of officials, mill-owners, and private persons interested in the improvement of the conditions of the working classes. We recorded a considerable body of evidence from all sources, official and otherwise. The existing state of affairs appears to be somewhat as follows.

The worst type of chawl consists of a two-, three-, or four-storeyed building, with single-room units either placed back to back or separated by a narrow gulley two or three feet wide, usually traversed by an open drain. The rooms, especially those on the ground floor, are often pitch dark and possess very little in the way of windows; and even the small openings which exist are closed by the inhabitants in their desire to secure privacy and to avoid the imaginary evils of ventilation. The ground floors are usually damp owing to an insufficient plinth; the courtyards

between the buildings are most undesirably narrow and, therefore, receive insufficient sun and air. They are also very dirty. Water arrangements are insufficient and latrine accommodation is bad, though the latter is being steadily improved. A most insanitary smell hangs round these buildings. The rents vary according to the value of the ground, which lies between Rs. 5 and Rs. 30 a square yard. The monthly rent per room is from Rs. 3 to Rs. 7, and the rooms themselves are usually about 10′×10′, with a small verandah in most cases. The share of this rent paid by a particular individual or family is not high in proportion to wages, but even so, the standard of comfort is so low that the overcrowding entailed by taking in boarders or lodgers is readily tolerated for the sake of the contribution to the rent received from them. Villagers, it must be remembered, seldom pay actual house rent, and it is not natural to workers belonging to this class to look on such payments as a just and necessary form of expenditure. Owing to the fact that, on the one hand, the original tenant very commonly takes in boarders or lodgers, while, on the other, the wage-earning population are absent at work for most of the day, and a large proportion of the inhabitants sleep out at night during the open season, and indeed only use the rooms for purposes of cooking and eating their food, it is far from easy to obtain a true idea of the degree of overcrowding that undoubtedly exists. We saw a few cases of three families occupying a single room, and numerous indications of the presence of single adult lodgers in rooms occupied by one or two families. But it is necessary to avoid exaggeration and to take into account the mitigating factors indicated above, such as the habit, which many of the occupants have, of sleeping out of doors. Dwellers in chawls possess a better outfit of cooking utensils than the average village agriculturist, and, though their clothing is usually dirty, they have plenty of garments of quite reasonable quality. They also appear to have an ample sufficiency of food, judging by the amount that is thrown away.

242. The chawls of the worst type do not, it would appear, constitute more than ten per cent. of the whole, although many of the remainder are distinctly insanitary. In the better class of labourers' chawls, especially those built by the Municipality and the Improvement Trust, conditions are of course different. There is more space between the buildings, there are more openings for light and ventilation, wider passages, and a more liberal provision of windows. Sanitary and water arrangements are generally suitable, although not in all cases on a sufficient scale. But it is very doubtful whether, even under Municipal or Improvement Trust management, overcrowding can be prevented, owing to the inveterate habit of the tenants of adding to their income by taking in lodgers. The verandahs, in which the members of the family bathe and dress, are easily overlooked from surrounding buildings, and, to secure privacy as well as to avoid draughts or rain, the inhabitants usually enclose them with matting or sacking. It has apparently proved impossible to prevent the tenants from disposing of rubbish by throwing it down from the upper floors. This practice, in spite of the efforts made

to keep the courtyards clean, leads to the presence of a large number of flies and adds to the unpleasant odour which seems to prevail in most labourers' chawls. We are of opinion that the single-storey line is, as a type, superior to the three- or four-storeyed chawl, and have no doubt that the ideal to be aimed at is a single-storey, or at the most double-storey, building with courtyards or, if possible, double-room units; and in any case ample space round the buildings. That such an ideal is impossible of general fulfilment in the congested areas of the south and centre of the Island, we readily admit. But we strongly support the conclusion reached by the Bombay Development Committee in 1914, that the north-east of Bombay Island and the south-east of the neighbouring island of Salsette should be accepted as the main future site for new factories and for the industrial settlements required by them and by existing industries.

Location of the mills.

243. The distribution of existing mills on the island of Bombay is as follows. There are comparatively small groups of mills in Colaba, at Sewri and Tardeo, with one or two mills in the neighbourhood of Mahim. But by far the greater number of the mills are concentrated between Worli and Chinchpokli. Some outlying mills, and one or two even in the more congested areas, possess sufficiently large compounds to permit of the erection of workmen's dwellings on land already in their ownership, or can find land at a reasonable price in their immediate vicinity. But even so, there is no practicable means of securing that the labourer so housed will work for the mill which has provided him with housing, owing to the immediate proximity of other mills, the capriciousness of the mill labourer, and the practice of recruiting mill hands through the semi-independent agency of jobbers. Striking instances of this were brought to our notice in the case of two mills, where only 57 per cent. of persons using the accommodation provided by the mills worked in those mills. These facts will be found important in fixing the responsibility for the housing of labour.

The Bombay Improvement Trust.

244. The Bombay Improvement Trust is the body which at present discharges the duty, so far as it devolves on the local authorities, of providing accommodation for the poorer classes. In the course of effecting improvements it has dishoused about 72,000 persons, of whom 53,000 have been provided with accommodation, mainly by lessees of the Trust. The Trust itself has provided 4,630 rooms in permanent and 953 rooms in semi-permanent chawls. The total average population of these was 18,247. The rent varies from Rs. 3-4 to Rs. 5 per room. The average capital cost of land and buildings per adult housed in permanent chawls was Rs. 286.

The Trust, after completing the programme of road improvements laid down for it by the Bombay Government in 1909, is, it is stated on page 35 of its annual report for the year 1915-16, in a position to take up the erection of chawls and the improvement of slum property in new schemes of an unprofitable nature, provided that the aggregate loss on

such schemes, as expressed in terms of present value, does not exceed Rs. 122 lakhs.

Suggested schemes for dealing with congestion in Bombay City.

245. We had before us the following schemes :—

(1) The Improvement Trust scheme, which offers an employer the option, on payment of a deposit of 20 per cent. of the total estimated cost, of having land, if necessary, acquired and buildings erected for him by the Trust, on its standard plans. The buildings are then made over to the employer on lease for 28 years, the annual payments being fixed at a sum which, together with the initial deposit, is sufficient to pay interest and sinking fund charges, with the result that, after the end of the period, the building becomes the property of the employer. Though this experiment was started in 1913, only one mill has so far availed itself of the scheme. Under pre-war conditions the estimated cost was Rs. 700 a room. Under war conditions, this figure rose to Rs. 972 ; and it may be a long time before the cost of building in Bombay returns to normal figures. Taking Rs. 972 per room as a basis, with cost of management and maintenance and 6 per cent. on capital cost to cover interest and sinking fund charges, the rent would work out at Rs. 7 a room. This figure should be reduced by the amount of sinking fund charges, which come to 2 per cent ; but even so, the resulting rent is a high one, and will probably be paid only at the cost of overcrowding. The general inability of the mill-owner to make certain of his building being occupied by his own mill hands only, and the high cost of construction, involving high rents, probably account for the fact that the proposals have so far failed to prove attractive.

The scheme is, in our opinion, good so far as it goes, but does not seem likely to afford a solution of the problem without other measures of a wider scope, which we shall propose below. The Improvement Trust scheme might, we think, be continued *pari passu* with these.

(2) Another proposal was put forward on the following lines. The land should be acquired at the cost of Government in suitable areas adjacent to the different groups of mills. The buildings should be erected by the Improvement Trust, and should accommodate all the single adults and (eventually) two-thirds of the families employed. The buildings for the former class should be let at an economic rent to chawl-keepers, under the joint supervision of the Municipality and the Improvement Trust ; the others to the families direct, the mill-owners contributing Re. 1 per month per room towards the rent. Recreation grounds, schools, crêches and dispensaries should be erected by the Municipality in the neighbourhood of these tenements.

This scheme has the merits of recognising the responsibility of employers and the difficulty of inducing operatives to pay an economic rent under the conditions now existing in Bombay. But the basis on which the co-operation of employers is to be obtained seems to us too narrow to obtain the desired ends.

246. The question whether employers should or should not be compelled individually to house their own labour has arisen in an acute form in Bombay; and we have, therefore, entered into a somewhat prolonged discussion of the relevant factors. The Bombay Development Committee in their report proposed that 'mill-owners' should be compelled to take advantage of the Improvement Trust scheme, though their assertion of the principle that employés should be housed close to the factory or within easy reach of it, would make it appear that they contemplated the erection of the undesirable three- and four-storeyed chawls. As against the principle of individual compulsion, there is, first, the fact that, so far as we have been able to discover, in no country have employers been compelled by law to house their labour. In reply to this it is urged that Indian labour is weak and unorganised, and bad housing conditions in a tropical country are more harmful than in temperate climates. But Indian industrialists, in spite of the large profits which they have in many cases been enabled to earn under war conditions, are in a less strong position than their western competitors, both in respect of accumulated resources and financial facilities, and owing to the lack of traditional skill among their operatives and to the absence of a competent supervising class. To impose on individual concerns what must in many cases be a heavy financial handicap, would be undesirable and unjust. This burden would fall very unevenly on different mills, according to the financial position of each concern and the cost at which land for housing would be available in each case. There is the added objection that, in Bombay at any rate, where the case for compulsion is the strongest, it would be impossible, as already pointed out, for employers, if compelled to assume responsibility for housing their labour, to ensure, without an impracticable degree of interference, that the accommodation so provided is used only by their own employés. It would be manifestly unjust to employers to compel them to build houses for their labour, unless that labour was equally bound to occupy them. Again, it would be most unfair to limit compulsion solely to mill-owners, while not enforcing a similar obligation on the employers of other classes of labour, and a difficulty would be found in applying it to smaller employers, or in deciding where the line should be drawn. Finally, there are objections, from the labourer's own point of view, to the creation of a general system of landlord-employers, which would tend to keep labour too dependent on the latter. This position cannot always be avoided, but it should not be the object of our policy. Though, as we have stated, we are opposed to the principle of enforcing responsibility on employers by compelling private industrial concerns to house their own labour, we fully recognise this responsibility, and shall propose means for effecting its enforcement collectively, and with a consequent lightening of the burden by distributing it over a wide basis.

The case for and against compulsion to employers.

247. We have recently seen proposals of the Bihar and Orissa Government for compelling coal-mine owners to house their own labour. But here circumstances are very different. The population of a coal

field is not an administrative unit like that of a large city, with a diversity of livelihoods but a common interest in the success and prosperity of all of them. The entire income of the coal fields is derived from the coal and, therefore, from the coal-raising concerns. The income-earning power and prosperity of Bombay, on the other hand, are by no means entirely dependent on industries. The Municipality of Bombay is a body which represents, and can reach with its taxation all classes of the community; and it has a well-established entity of its own. Where, as in the coal fields, such an organisation does not exist, it may be necessary to throw on individual owners the responsibility for housing their labour, a responsibility which, owing to the natural conditions of mining, is usually accepted by owners in actual practice. We think, therefore, that proposals regarding a coal field are scarcely a precedent for the imposition on individual employers of the duty of compulsory housing in a big city.

Responsibility for the financing of industrial dwellings in Bombay.

248. Before putting forward our suggestions as to the lines on which the present state of industrial housing may be improved in Bombay, we think it necessary, in view of the suggestions for Government assistance that have been put forward, to discuss briefly the degree of responsibility attaching to the various public authorities that may conceivably be called upon to contribute. We would, in the first place, point out that, though the economic area which exports through Bombay is interested in having a good market for its raw products, especially cotton, and in the existence of adequate facilities for their transport by land and sea, it is not concerned with the question whether the raw product is manufactured in Bombay city or elsewhere. Indeed, it may be argued that, from this point of view, the general interest of the area concerned will be best served by the encouragement of the existing tendency to establish mills in various localities up country, such as Ahmedabad, Sholapur, and Indore. On the other hand, the city of Bombay is directly interested in the question of housing its operatives. We consider, therefore, that the largest share in the cost must necessarily fall on the city of Bombay, as represented by its Municipality and Improvement Trust, but we think that the importance of Bombay, both as a city and as a port, warrants some measure of assistance from the Local Government. The co-operation of employers is also necessary, and we shall indicate below the manner in which we think it should be secured.

Recommendations regarding congestion in Bombay City.

249. In framing our proposals dealing with the housing question in Bombay, we have to keep in mind two points of view; firstly, the avoidance of future congestion, and secondly, the amelioration of the existing state of affairs. On the first point, we generally support the recommendation of the Bombay Development Committee. We consider that no industrial concerns should be started in the future, except in the north-east of the island of Bombay or in south-eastern Salsette, without the sanction of the Municipality, which should be withheld in

cases where the location of the proposed industry is likely to produce congestion or is otherwise unsuitable; and that an adequate scheme of drainage and water supply should be put in hand to prepare the areas set aside for development, not only for industries but for industrial housing. Any industry which may start in the northern area will probably have to provide its own housing; and the requisite powers, including the power to determine whether or not a certain class of industry may be admitted to certain sites, should be taken by the local authorities, to ensure the development of the settlement on proper lines and to prevent the formation of slums or insanitary *bustis*.

250. Bombay is peculiarly unfortunate in having the main workshops of two large railways situated actually in the city, a state of affairs which exists in no other large town in India, and certainly should not be allowed to continue in Bombay any longer than can be helped, or be repeated elsewhere. The railway companies should, therefore, be induced, as much in their own interests as in those of the general public of Bombay, to locate their new shops, the building of which cannot be long delayed, at a reasonable distance from the city, even further afield than the industrial area proposed above, if possible; and should provide housing for their labour *in situ*. No railway, Government department, or public body should depend for the housing of its labour on notoriously congested areas, whether in Bombay or elsewhere. Housing of a suitable type should be provided, and, where practicable, in the northern industrial area. Improved means of communication, including the electrification of suburban railways and the extension of the tramway system, will in any case be required; and these will help to induce an increasing proportion of the working population to seek accommodation in the new industrial suburb.

251. With regard to industries already located in the city, the existing position must be accepted as a basis, but the conditions can and should be considerably improved. A definite standard for industrial dwellings should be determined, and a programme of building worked out and taken up at the expense of the local authorities, who should then manage the buildings. If the existing resources of these bodies, together with such assistance as the Local Government may be able to spare, are not sufficient for this purpose, then further taxation should be imposed in such a way as to fall mainly on the employers, whose co-operation may most suitably be obtained in this form. Due account should be taken in this event of cases where employers have already made adequate arrangements for the housing of their labour.

We recognise that the outlay involved will be very heavy; but though we think it inadvisable to attempt any estimate, we do not consider that the cost will reach an impossible figure. The delay, which has already been allowed to occur, has greatly increased the estimate which would have sufficed a few years ago, and it seems fairly certain that further hesitation will make matters a great deal worse. For every reason, therefore, action should be taken at once.

General Measures.

252. We have received evidence in one or two provinces on the subject of factory hours. It was generally agreed that mill hands loiter away much of the time during which they are nominally at work, one or two prominent factory owners stating that the operatives did not actually work for more than 8 hours out of the 12 at present permitted by the factory law. Some witnesses said that, if the hours were reduced, workmen would still waste so much time as seriously to reduce the present rate of production. Others seemed to favour a ten-hour day, but were afraid that it would lead temporarily at any rate, to some reduction of output, which might handicap Indian mills as against foreign competitors. The present factory hours were laid down after prolonged consideration and after an enquiry by a Commission, appointed for the special purpose of examining the conditions under which factory labour worked and of devising suitable legislation. We are, therefore, hardly in a position to make any definite recommendation regarding the hours of employment, a question which requires far more detailed consideration than we have been able to give to it, but deserves, we think, further examination. In other countries it has been found that a reduction of the number of hours spent inside the factory has been possible, consistently with the employment of the machinery for a longer time by means of the shift system, and that shorter factory hours have exercised an important effect in the direction of improving the standard of living of factory hands, and have helped in diminishing the congestion of labourers' dwellings, by giving time for employés to come in from areas situated at a little distance from their work. But further enquiry is necessary to ascertain how far such measures are possible in India ; and we recognise that, in any case, until the workers have learned how to use a longer period of leisure more advantageously, such a concession may not be an unmixed benefit.

Factory hours.

253. We desire to draw special attention to a note (Appendix L) prepared by the Sanitary Commissioner with the Government of India on the effect which the improvement of public health may have on industrial development. He has, in our opinion, given good reasons for a belief that, with a proper organisation for the care of public health, the efficiency of our labour force, especially in the case of organised industries, could be definitely and substantially increased. His note, we think, also gives ground for belief that the conditions under which industrial labour lives in India can be made far more healthy and, therefore, more attractive. The fact that we received so little direct evidence on this important subject is a striking testimony to the general ignorance of the serious effect which various forms of preventible disease exert on the efficiency of Indian labour. The question of public health is, we fully recognise, one on which much can be said from a far wider point of view than from the purely economic aspect in which we are now regarding it. But we think that the presentment of the case for action will be

Improvement of public health.

not the less forcible, if we confine ourselves to the severely practical problem of the loss from preventible disease to employers and employed.

It is clear that the improvement of the health of industrial workers cannot be discussed separately from the question of public health generally, if only for the reason that a large proportion of Indian industrial labour moves periodically from village to city and back again. The Sanitary Commissioner's note indicates clearly the lines on which the requisite organisation for the care of public health must be formed. The existing evils are widespread, and can only be dealt with by an equally widespread organisation. Into the details of such a scheme we cannot enter in this report; we have made certain specific suggestions to meet individual defects; but we feel it necessary to point out here that we believe the effect of preventible disease on industrial labour to be very great, while the establishment of a satisfactory organisation to combat it is bound to have appreciable results, and may lead to benefits beyond any thing which we can at present estimate.

General welfare work.

254. Measures for the welfare of operatives in India fall under the heads of co-operation, the provision of open spaces and other facilities for recreation, medical attendance, and instruction by various methods and in various subjects. Steps in these directions are being taken by Government departments, by the more enlightened mill-owners, and by private associations like the Servants of India Society and the Social Service League. The necessity of providing open spaces for recreation is generally recognised; medical facilities, when on the right lines, are freely resorted to by the labouring classes, and we would emphasise the urgency for a further extension of these. Co-operative work among labourers and especially among mill hands presents serious difficulties, owing to the fluctuating nature of the population and to the lack of a common interest. But their indebtedness and the extent to which they are exploited by the shop-keepers from whom they buy their daily supplies furnish a very strong case for a special effort. Employers may give most valuable aid in all these directions; and, in particular, by starting benefit and provident funds and by the provision of compensation for injuries, etc., received by their employés, a measure which, though already taken by a few public-spirited industrialists, should be much more generally followed. The encouragement of sports and athletics will improve the health of operatives and increase their interest in life. Finally, there are many subjects on which the urban working classes require instruction. The rules of health, diet, and sanitation; the care of children; the evils of intemperance; all these are matters which require to be constantly pressed on the attention of operatives. The latter question is, in particular, one that affects the standard of comfort and the efficiency of labour very deeply, and we feel it necessary to point out the temptations that the existing facilities for liquor drinking put in the way of the workmen, and the necessity of removing the liquor shops as far as possible from the neighbourhood of mills and factories, and of providing alternative attractions in the form of places for the sale of temperance beverages. Libraries

and reading rooms will afford means of instruction, as well as of amusement, and the same may be said of cinema displays. Street or indoor lecturing is also often a useful method of imparting knowledge or awakening interest. Employers might give occasional opportunities for moral and religious instruction, especially where they have provided accommodation for workers in large settlements. It must be recognised, however, that official organisations, as at present constituted, are ill suited for work of this sort, and nothing really substantial or satisfactory can be accomplished without the disinterested labours of private individuals and associations, which, with one or two brilliant exceptions, have, so far, been sadly lacking. Government and local bodies as well as employers, however, can and should assist such efforts, both financially and in other ways; but the direct participation of official agency in social welfare work must wait until the civic sense has become more fully developed, and we therefore think it out of place to make definite suggestions.

CHAPTER XVII.

Cottage Industries.

Present position of cottage industries.

255. One of the most striking features of Indian industrial life is the vitality of the old domestic industries, and in a previous chapter we have briefly indicated the reasons for their survival in the face of factory competition, both Indian and foreign. The instances to the contrary, however, are instructive. The spinning of cotton by hand has entirely disappeared. In the towns, the work of paddy pounding, wheat grinding and other laborious home industries is being more and more performed by power-driven mills, and for social and economic reasons no one will regret the change. The relief of women from these household burdens is a step in advance, and leaves them leisure which they may in the future devote either to more cultured domestic occupations or to more productive work. The part played by women in cottage industries in India includes only the less skilled operations, except in Assam and Burma ; in these provinces they carry on the whole business of weaving, and in Burma they also take an important share in other skilled manufactures.

Apart from the beneficent changes brought about by the cotton mill, the rice mill and the flour mill, modern industrial enterprise has left India in substantial possession of its cottage industries. The imports from abroad and the products of Indian factories have been absorbed by the largely increased demands of the country. Nevertheless, it must be admitted that the condition of village artisans is far from satisfactory and that they are, in earning capacity at any rate, in an inferior position to the employés in organised factories. It must be assumed that cottage industries have survived because they are so far adapted to their environment. The artisans produce commodities which are in demand and so far have not been displaced by factory-made goods, and they work under conditions which they prefer to factory life. It must not be imagined, however, that the artisan of to-day is wholly uninfluenced by the industrial changes of the past century. His methods remain the same, but in some instances he works with superior raw materials and in others with better tools. The weaver has taken to mill yarn, the dyer to synthetic dyes, the brass and copper smith to sheet metal, the blacksmith to iron rolled in convenient sections, in each case with advantage to himself from the lessened cost of production, which has greatly extended his market. In some districts in lower Bengal, the weavers use the fly-shuttle slay extensively ; and they have recently adopted it in large numbers in the coast districts of the Madras

Presidency ; while it is also gradually coming into use elsewhere. The tailors invariably employ sewing machines, and town artisans readily take to improved tools of European or American manufacture.

A general review of the evidence tendered to us, supplemented by numerous inspections in the towns and villages that we have visited, confirms us in the conclusion that cottage industries are a very important feature in the industrial life of India ; that they are by no means so primitive as they are usually depicted ; and that there is no real ground for belief that they are generally in a decadent condition. We have been unable to obtain accurate statistics regarding the actual number of workers in the various cottage industries, but in every town they still form a large percentage of the population, and they are to be found in almost every village, so that their numbers are still vastly larger than those of the operatives employed in organised industries.

Hand-loom weaving.

256. Of these cottage industries, the most important is hand-loom weaving. It is believed that between two and three million hand looms are at work in India, and their annual gross earnings must amount to something like fifty crores of rupees. Hand spinning has entirely died out ; accurate statistics are available for the production of yarn, the output of cloth in Indian mills, and weaving sheds, and the imports of yarn into India ; and it is thus possible to ascertain how much yarn is absorbed in the hand-loom industry. Calculations have been made which show considerable fluctuations from year to year, but, on the whole, a tendency to an increased rather than to a diminished consumption. There is some reason to believe that weaving from coarse yarn is declining, while the medium and fine weavers are chiefly responsible for the increase.

The subject has been dealt with in a separate note (Appendix I), based on the census figures and the returns of production and of sea-borne trade. In connection with this note, we desire to draw attention to the unsatisfactory means provided by the ordinary census for the collection of useful occupational statistics, and to suggest the adoption of special enquiries for this object, which is at least as important as the ethnological discussions that have hitherto figured so largely in census reports.

Metal working.

257. Next to hand-loom weaving, metal working is the most important cottage industry ; but there are no means of ascertaining accurately the numbers employed. The goldsmiths are flourishing ; the brass and copper workers have undoubtedly felt the competition of imported enamelled iron ware, glass and crockery ; but the greater purchasing powers of the people have enabled them to absorb these domestic novelties and to substitute brass and copper vessels for village pottery.

Sericulture and silk weaving.

258. Sericulture based on the mulberry tree or shrub is an important cottage industry in certain districts of Bengal and in Mysore. It also flourishes under State control in Kashmir and Jammu. Other forms

of sericulture dependent on the *eri*, *tasar* and *muga* silkworms, are widespread in Assam, Chota Nagpur and parts of the Central Provinces. Mr. H. Maxwell Lefroy has submitted to the Government of India a very detailed report on the silk industry, which we discuss in Appendix G. Disease among the worms seems to be the silk grower's principal difficulty. The indigenous methods of silk reeling are crude, and there is a case for the establishment of central factories to deal with cocoons. Indian silk weavers largely use imported silk, while the Indian silk is exported from the country for the manufacture of velvets and silk hats. The local silk is full of knots and loose ends, and is of very unequal strength. Consequently, it gives the weaver much trouble to prepare it for the loom, and he prefers the more even re-reeled silk imported from China.

Dyeing.

259. The indigenous dye industry has felt probably more than any other the effects of modern technical progress. When colouring matter was derived chiefly from vegetable sources, the processes were lengthy and laborious and the results uncertain ; the use of imported synthetic dyes greatly shortened and simplified the operation and gave more certain results, thus enormously reducing the cost. Many dyers had, perforce, to seek other means of livelihood, and the attempts made since the war to replace the synthetic dyes have established the fact that vegetable dye stuffs are, and always must be, incapable of meeting the demands of the industry on its present scale, both as to quality and quantity. Further, the change in taste brought about by the brighter synthetic dyes renders it difficult to find a market for the thinner and duller, though perhaps more pleasing, colours of vegetable origin.

Suggested remedies for defects of present position.

260. The cottage industries of India are many ; some of them are peculiar to the country ; but the great majority are to be found in some form or other all over the world. It is needless to emphasise the artisans' conservatism, lack of ambition and present inability to appreciate a higher standard of living. They are very ignorant, and obviously the first step towards their improvement is to educate them. In most cottage industries the children can be employed at an early age, and it often falls to the women to take a full share of the work. The care of children is, therefore, apt to be neglected, and they are put to work much too soon with the view of adding to the family earnings. Every gradation of skill and craftsmanship is found in these cottage industries, and, where a higher standard of comfort exists, the necessity for some education is recognised. Various efforts have been made to improve the condition of the artisans, but they have been feebly conceived and ill carried out. The Mission industrial schools deal almost entirely with Christians, and those started by Distri t Boards, Municipalities or private agencies hardly show that the very difficult problem has been seriously considered. Pupils are attracted by scholarships ; the training is generally no better than could be obtained in the bazaar, and the bulk of the

pupils belong to miscellaneous castes and certainly are not children of artisans.

Our enquiries force us to the conclusion that the crying need of industrial India at the present time is the provision of much greater facilities for the education of the artisan population. Apart from such general measures as Government may find it possible to introduce in the near future, we have recommended the establishment of an efficient system of industrial education in special industrial schools under the control of Departments of Industries.

In modern industrial countries, such as Great Britain, the old system of apprenticeship to master workmen has almost died out ; but its decay occurred long after the practical extinction of cottage industries, and it was replaced by a widely extended system of evening classes in polytechnic and municipal technical schools. The conditions here are altogether different. The industrial school in India has achieved little in the past, yet it seems capable of being rendered an efficient means of educating the workers in cottage industries in the future. But no matter what steps are taken to improve the instruction given in the schools, the results will be negligible, unless the pupils can be induced to go through the whole course, so that their training is complete when they leave. The cheapness of living in India is a powerful weapon in international competition ; but it is of little avail if the labour is inefficient and unorganised. There is no likelihood of cottage industries becoming extinct ; but improvement in the condition of the workers is not probable, unless better tools and plant are employed and an intelligent subdivision of industrial processes introduced. There is a tendency, which will probably be accentuated, to organise small factories, and this should be encouraged. Such a result is, however, more likely to arise from individual capitalist effort than from anything like co-operation among the artisans.

Training of master workmen.

261. The fact that the individual artisan can make a living under the cottage system has attracted the attention of the educated classes in recent years. They have observed that there was room for great improvements in methods and scope for the employment of capital. Accordingly, numerous attempts have been made to start small factories, into which it was intended that the artisans should be drawn. In only a few cases has success been achieved, and then, as a rule, by men who had acquired a practical working knowledge of the trade in question ; but this fact is sufficient encouragement to warrant further efforts in this direction. In each industrial school provision should, therefore, be made for the instruction of a small number of pupils of a higher class with better educational attainments and with prospects of being able to command sufficient capital to start eventually in the trade themselves. In the case of weaving, something in this direction is being done at the Government Weaving Institute at Serampore, where a considerable number of fairly well educated young men are undergoing a course of instruction, which is intended to fit them ultimately to become master

weavers. The scheme, however, fails to produce satisfactory results, owing to the absence of opportunities to acquire practical experience in the control of workmen and in the management of a commercial business. There are no hand-loom factories or village associations, in which such training might be obtained, and it is necessary to arrange for a few small undertakings on these lines, if possible under private control, with assistance from Government in whatever form proves most suitable, to serve as demonstrations of work under commercial methods. Failing private enterprise, a purely commercial section should be attached to the larger weaving schools, with the avowed object of supplying the training, other than purely technical, which a master weaver must possess before he can hope to start in business for himself.

We have dealt specially with weaving because of its intrinsic importance. As we have pointed out in Chapter X, however, there are essential differences between weaving and crafts such as, for instance, metal working and carpentry. For these, instruction is needed rather than commercial organisations or the training of master craftsmen.

Financial assistance to cottage workers.

262. We think that attention should also be concentrated on helping the individual workman to escape from the clutches of the money-lender and to obtain credit on easy terms. We make certain suggestions to this end in the following chapter, but, in cases which cannot be reached by the organisation for co-operative credit, Directors of Industries may well be empowered to grant small loans and to supply tools and plant on the hire-purchase system. The difficulties experienced in dealing with this class of worker are well known, and the power to grant such loans must be exercised cautiously ; but, while the terms on which they are to be recovered should be easy, the margin between the cost of providing the money and the rate at which it is lent should be sufficient to render the business profitable, as the ultimate aim should be to hand over such transactions to co-operative societies or other agencies.

Artistic industries.

263. In former times the art crafts of India reached a high degree of perfection under the patronage of the rulers of the country. As cottage industries, these arts and crafts are still carried on, and the skill and tradition of each are handed down from generation to generation. But the disappearance of the personal relations between worker and patron has had a disastrous effect. It has deprived the former of his main incentive to excel, and has placed him entirely in the hands of the dealer, who does not require articles which appeal to cultured taste, but merely such as will find a ready sale. There are schools of art in Calcutta, Bombay, Madras, Lucknow and Lahore, but the effect of these on the workers is limited. The Victoria Jubilee Technical Institute in Madras, with funds contributed partly by the public and partly by Government, has a show room devoted to the display of the arts and crafts of the Presidency. Most of the articles are purchased from the people who made them, and they

are all for sale. Only approved exhibits are accepted, and, as quality rather than cheapness is the aim, the Institute is gradually inducing the craftsmen to return to the higher standard of work formerly in vogue, but no longer possible if their only means of disposing of their productions is to sell them to the art curio dealer, who purchases them by the dozen at the lowest rate he can get the workers to accept. We saw a similar institute at Bangalore, and the Director of Industries in the United Provinces has opened a sale room in Cawnpore on somewhat the same lines, though this latter institution is not confined to the sale of artistic productions. These depôts offer promising prospects, but their weak point at present is their lack of a sufficiently aggressive policy. There is no one to instruct the craftsman, to criticise his work and to supply him with new ideas and designs. The men remain isolated in their villages; and, though there is a permanent display of their productions, there is no attempt, except in Rangoon, where there is, however, no school of art, and in Lahore, to hold periodical exhibitions, where craftsmen may be brought together to compare their work with that of others. Most important of all, the business side is neglected, and the depôts depend almost entirely upon casual visitors for the disposal of their exhibits. No use is made of the ordinary business methods by which sales are effected. There is practically no advertising, and no attempt is made to place the art productions of the country on foreign markets. A bolder policy and more vigorous management should be adopted, and the show rooms and depôts should be more closely associated with the provincial art officers, whose influence over the craftsmen will be greatly strengthened, when the latter find that there is a ready sale for work produced under expert artistic supervision. We have given reasons in our remarks on the cottage industries of Burma (Chapter II) which seem to show that the field for action is specially promising in that province.

The provision of markets for products of cottage industries.

264. An essential feature, in fact, of any attempt to develope cottage industries in India must be the opening up of new markets for the goods produced. Many of these industries have survived because of their ability to satisfy the strongly marked local demands for special designs. But where productions go far afield, it is through the agency of middlemen and merchants, who, however, have so far shown little enterprise or originality in the necessary directions when we have indicated above. We need only mention the toy industry of Germany, the straw-plaiting work of Luton, and the many cottage industries of Japan, as examples of what can be done when enterprise and organisation take in hand the marketing of goods. This really pressing problem confronts any one who would try to put the cottage industries of India on a better footing. Where a greater demand for their products has been created, the artisans have almost invariably sought on their own initiative to improve their means of production, but it requires capital to establish new markets, and in a subsequent chapter we make specific suggestions for dealing with this problem.

Not a little of the industrial success of modern Japan is due to the attention that has been paid, not only to the education and technical training of cottage workers, but to the building up of business organisations, which take over the products of their industry and dispose of them all over the world. The little that has been done in India in this direction is full of promise ; but it is almost entirely for internal trade. From the great centres of indigenous weaving and metal work, goods are sent far and wide, but usually only throughout India. The staple products of Benares, Aligarh, Moradabad and Madura, to mention but a few of the larger towns where these industries flourish, are found in most parts of the country, but little or no attempt is made to cater for foreign markets. The nature of their demand, actual or potential, is unknown, and there is no one to direct attention to their possibilities. It is true that in the south of India there is a considerable export trade in what are known as Madras handkerchiefs and Singapore *lungis*, both products of hand-loom weaving and both specialities which find no sale in India. But Indian merchants have undoubtedly neglected the potentialities of cottage industries, and have done nothing to encourage the workers to produce goods of a class which would find a ready market outside the country. The Swadeshi Stores in Bombay are a good example of an active and successful agency for the internal distribution of the manufactures of cottage and other Indian industries, and they have been evidently of great assistance to a number of cottage industries, by making known to dwellers in large cities like Bombay and Poona what other parts of the country are producing. If the Departments of Industries work in co-operation with a business institution of this sort, they will find it a ready means of introducing the products of both existing and improved cottage industries to extensive markets, while it will in turn derive benefit from the information which the Departments can place at its disposal.

CHAPTER XVIII.

Co-operation for Small and Cottage Industries.

Present position of co-operative effort with regard to cottage industries.

265. Certain difficulties besetting cottage industries resemble problems which, in the case of agriculture, are being solved gradually by co-operation. Co-operative bodies for the distribution of seed have had a striking success on a very extended scale. In some cases, societies for the sale of agricultural products, such as the *gur*-selling societies in the Deccan, have also done well. One or two have been started to work cane-crushing and *gur*-making plant in Mysore, and in several provinces others have taken up the sale of agricultural implements. In the field of industrial co-operation, credit societies seem to have attained the largest degree of success, especially among small urban artisans who live and work in communities, and in particular among weavers. The funds advanced are mainly used for the purchase of raw materials and implements, or to finance the sale of finished products. In addition to these, there are also a few societies which deal solely with production or distribution or a combination of these. The scale on which co-operative credit societies are at present working is very small, when compared with the vast field for their services offered by the millions of small agriculturists and village artisans in India; but they have been at work sufficiently long to enable certain conclusions to be drawn regarding their possibilities.

The following principles seem to be of general application in the case of all co-operative bodies, agricultural or industrial, that deal with purchase, production or distribution.

266. In the first place, before any such movement can be organised, the ground must usually be prepared by the educative influence of co-operative credit, the simplest and most readily accepted form of co-operation in this country. In the next place, the central banks, the secondary co-operative bodies which are the main financing agents, look with considerable and quite justifiable doubt, on societies of a new type, until their soundness has been thoroughly established by success, and, not least so, on industrial societies the members of which cannot offer landed security. Again, in many cases, especially in those which require some degree of technical skill or knowledge on the part of the agents employed, or need a more widespread organisation than a single credit society can offer, it is better to work through co-operative bodies

founded *ad hoc*, or unions, as they are often called, than to entangle ordinary primary societies in responsibility for work which is not understood sufficiently by many of their members and makes too large a demand on the capacity of the societies. It would, for instance, be undesirable to saddle a small credit society, of which perhaps only half of the members grow cane, with the task of financing and looking after a cane-crushing and *gur*-making plant. Mutual acquaintance and trust are necessary assets in the case of a primary credit society ; but a primary weaver's society small enough to fulfil these conditions would not, in most cases, be strong enough to finance the sale of its output.

Where the products of an industry have a ready sale at a more or less fixed price, co-operative societies for credit or purchase are not difficult to work, but the advantages of co-operative sale in such cases are as a rule not very great. But where the market depends on casual purchase, or is a fluctuating or seasonal one, most of the workers are so largely in the hands of the money-lenders, who take these risks and charge very high rates for doing so, that it is not easy to help them, unless an organisation can be set on foot large enough from the very beginning to finance stocks and arrange sales. Success is more likely to be achieved with readily marketable articles, and the more difficult cases may be taken up. when experience has been gained with the easier ones.

Urban artisans who work individually, such as smiths, carpenters and, in many cases, metal and leather workers, do not readily combine in co-operative organisations with unlimited liability ; and without this, their assets are not sufficient to command much credit. A Registrar of experience expressed the opinion that the most hopeful method of helping men of this sort might prove to be through urban banks of the Schultze-Delitsch type, which, though their aims are co-operative, do not work on the principle of unlimited liability, and lend to individuals on the security of two other names.

Suggestions regarding future policy.

267. The main difficulty in the organisation of industrial societies for any purpose which involves dealings on a large scale—the sale of piece-goods for instance—lies in the absence of persons of intelligence and standing acquainted with the business, whose interests are yet not necessarily opposed to the success of the scheme. The cloth merchant is directly interested in maintaining the weaver in his present state of bondage, while few educated persons have sufficient knowledge of the business and sufficient public spirit to be able to organise it with success. There are, in the case of agricultural societies whether for credit or distribution, a fair number of public-spirited landholders, with interests diverging but little from those of their tenants, who have sufficient acquaintance with agriculture to manage the distribution of seed or manure. The need for unofficial and properly qualified workers in this field is very great, and it has been suggested in the preceding chapter

that until the deficiency can be met, the most promising policy, at any rate among domestic workers in towns, is either to introduce the small entrepreneur who would organise production by putting out work for partial manufacture in the workman's home and completing it in a small factory; or simply to bring together isolated workers into such a factory and pay them better wages than they can earn themselves under present conditions. Such schemes, if successful, would no doubt add greatly to the efficiency of production, though they would lower to some extent the status of the workers, and expose them to the risk of exploitation.

268. In view of the importance of improving the position of the cottage worker where he is handicapped, as at present, by the want of a free sale for his goods, it is justifiable to incur some risk in experimental efforts. A case or two might be selected, which careful previous investigation had shown to be free from special difficulties, and attempts made to build up an organisation for the sale of the manufactured products. Such attempts have already yielded promising results in the case of the Bengal Home Industries Association, which is a private effort, and in the Government depôt at Cawnpore. But smaller and perhaps specialised agencies are also required for the local collection of articles, which can then be supplied regularly to central institutions or large shops. Such local institutions might be started with Government assistance and control in the first instance, and afterwards converted into co-operative unions. In view of the success which has, in some cases, attended the sale by Government agency of goods prepared by weavers employed as a famine-relief measure, such a venture ought not in any case to involve serious loss. A scheme of this kind would appear particularly likely to succeed in Burma.

In agricultural or industrial societies, the object of which is the purchase and employment for the common advantage of comparatively costly machinery or plant, it seems necessary, until the confidence of central banks is gained, to give direct assistance in the form of *takavi* loans on the joint and several liability of the members, who should ordinarily be able to offer landed security. This proposal, which is merely an extension of the principle of land-improvement loans, has been explained in greater detail in Chapter XX.

Functions of Director of Industries.

269. One of the duties of the Director of Industries should be to initiate industrial societies, especially in cases where fresh ground is being broken, and to afford assistance to them in technical and commercial matters after they have been started. Opinions differ as to how far the supervision of purchase and sale should be considered within his scope. The Director of Industries can obviously have no part in the administration of the statutory provisions applicable to co-operative societies. But he should be responsible for advising the societies on matters involving technical detail, on the provision of new markets

for products, and on the commercial aspect of proposed schemes. Whether and how he should deal with agricultural societies organised for the employment of machinery, such as cane-crushing power plant, must depend on the decision reached regarding the control of agricultural engineering work.

The intimate connection between co-operation and the improvement of agriculture and cottage industries cannot be too strongly emphasised; and the officers who control these three branches of administration must recognise this connection, and develope it by keeping very closely in touch with each other, if they are to achieve genuine success in the discharge of their duties.

CHAPTER XIX.

Industries and Transport.

Effect of railway rates on Indian industries.

270. We received from witnesses a number of complaints to the effect that Indian railway policy does not tend to foster the industries of the country. On the other hand, those who have been favourably treated or are satisfied with the existing position are naturally silent, and the case has, therefore, been only partially represented to us.

The question of railway rates, is a very difficult one, requiring a wide range of detailed and technical knowledge for its proper understanding and still more for its efficient treatment. But there are certain general principles which stand out clearly and seem to bear directly on the specific subjects with which we are dealing. Our recommendations will be of more practical use if we avoid detail and frame them on broad and simple lines.

General course of traffic and its effect on railway policy.

271. Before the war, the major portion of Indian railway traffic flowed in two streams—raw products moving towards the ports for export, and imported manufactured articles moving up country from the ports. Of these the first was by far the greater. The policy of the railways has been based on this position and has followed and tended to stimulate these movements of trade. Large volumes of traffic can, it is true, be more economically handled than a number of casual driblets; but there has also been rivalry between Bombay, Calcutta and Karachi to supply with imported goods the debatable land where their respective railway systems touch, and to attract produce from it for export. The competition between cheap river transport by the Ganges and the East Indian Railway which runs alongside that river has caused the latter to lower its rates in some cases, leading to a corresponding reduction of rates by the Great Indian Peninsula Railway. The influence of the large shipping companies has also not been without its effect on the railways serving the ports; a line of steamers naturally wants goods conveyed to it as cheaply as possible, and can offer a railway serving its port of call important help in attracting traffic to that port. Coastwise traffic has also in many cases had a considerable influence on railway rates. In consequence many inequalities have arisen between goods for export or imported articles on the one hand and goods for internal use or locally manufactured articles on the other, in areas where railways compete with one another or with water transport; and speaking generally, favourable rates for raw

produce moving to the ports have resulted. We are naturally not in a position to prove that in any individual case these rates are unnecessarily low. But the history of rate fixation reveals a desire to divert traffic from one Indian port to another, rather than a careful examination of the effect which the rate imposed would have on the total cost of conveying the goods to their port of foreign destination, and therefore on their ability to compete with products from rival sources. Presumably relevant local circumstances are duly taken into account when rates are fixed; the point which we desire to make is that there has been a tendency to think of attracting traffic to a particular railway rather than to consider whether a real necessity exists for reduction in the general interests of the country. Indeed it is possible that a moderate increase would not materially affect the quantities coming forward. As an example of undue reduction of rates on exports, we would quote the case of hides. Their production cannot be affected by railway rates, though their disposal may be; and the grant of port rates nearly 50 per cent. less than the internal rates has certainly discouraged Indian tanning, and aided certain foreign industrialists to obtain a hold on a class of raw material of which India possesses a partial monopoly.

The fixation of railway rates on imports has followed much the same lines as those which we have discussed in the case of exports.

It would be easy to support the statements made above by numerous instances; but the facts are generally admitted. The fixation of a single rate is governed by so many considerations that the citation of individual cases would often be unfair, if each were not fully analysed.

Necessity for a change in rate fixation policy.

272. The efforts of the country in future will be directed to bringing raw materials to the most finished state possible before export; indeed, appreciable advances in this direction were already being made before the war, and the policy underlying the whole of our recommendations depends on the acceptance of this desideratum. The governing principle which, we think, should be followed in railway rating, so far as it affects industries, is that internal traffic should be rated as nearly as possible on an equality with traffic of the same class over similar distances to and from the ports. This principle must of course admit of numerous exceptions, in consideration of the competition of water transport, the cost of working particular sections of line, the convenience of handling, the advantage of return with full loads, and many other factors. But we would press for its acceptance as far as possible in the case of raw materials conveyed to, or manufactured materials conveyed from, an Indian manufacturing centre.

We are well aware that numerous concessions have already been made for the benefit of Indian industries; we have seen a long list of such in the case of the East Indian Railway in particular. But our principle premises more than individual concessions; it involves the necessity of considering from the widest possible point of view, how far the existing low rates on produce for export are really required: equality

may be better attained by raising a rate which is needlessly low, than by reducing one which is not intrinsically too high. It would, we recognise, be most unwise to set on foot a policy of individual concessions to industries, without laying down any general principle to guide and limit them; one concession of this kind involves an incalculable sequence of others, and the eventual loss of income is likely to be very serious. We do not, of course, entirely bar the idea of individual concessions, and we shall indicate later the lines on which we think these may be safely given. But if existing inequalities are redressed on the basis that we have suggested, the necessity for such concessions will be less. We may draw attention here to the substantial rise in the price of raw products and in running expenses, which is likely to continue in many cases for long after the war. This is an added argument in favour of the reconsideration of the existing low rates for moving freight to the ports. We are aware that in 1916 these rates were raised under the general orders of the Government of India, apparently with the idea of maintaining, so far as possible, the distribution of traffic reached by past competition, while restoring to some extent the rates which that competition had reduced. The position should, however, be examined again from a wider standpoint than that of war time, and in estimating the effects of rating the criterion should be what the traffic can stand over its whole journey to the port of foreign destination.

Other effects of individualistic railway policy on rates.

273. We have pointed out above that one of the immediate causes for the low port rates was the competition between rival railway systems, which led them to look on some questions from an unduly individualistic point of view. Another instance of this attitude lies in the 'block rates,' or higher mileage charges for short lengths imposed on traffic moving from a station near a junction with another system towards the junction, in order to travel a much longer distance over that other system. Similarly, when 'scale' or 'tapering' rates are charged, which involve a reduction of mileage rate increasing with the length of the lead, each railway treats the length on its own system as the sole basis for its charges, irrespective of the total lead, and a consignment which divides a journey of 300 miles equally between three railways only obtains the mileage rate applicable to a lead of 100 miles. 'Terminal' charges are also sometimes used for a similar object, *viz.*, to extract as much as possible from traffic which will presumably travel a greater distance over a foreign line than over the line of its origin. There may be justification for these expedients in many cases, but it would appear that they often affect traffic undesirably. They have accentuated inequalities, and have, on the whole, tended to operate to the disadvantage of internal traffic and, therefore, of Indian industries. We think that railways should accept the principle which is followed in some other parts of the world, that a consignment travelling over more than one line should be charged a single sum based on the total distance, any special claims for extra cost incurred by a particular line in handling short-length traffic being met by the grant of suitable

allowances or of a suitably larger share to the less favoured line, when dividing the total payment between the railways concerned.

The congestion of industrial centres.

274. An incidental effect of the policy that has stimulated traffic to and from the ports has been the congestion of industries in port towns. The same advantage of favourable rates, granted to a less degree at other important traffic centres, has had similar, though less marked, results in their case also. We have found it necessary in Chapter XVI to comment at length on the serious labour difficulties created by the concentration of industries in certain centres, and we think that the railway rate policy which we have recommended would help to diffuse and decentralise industries, and thereby increase the availability, the comfort and the efficiency of labour.

Effect of proposed policy as applied to imports.

275. We have suggested an examination of the desirability of raising the existing low rates on raw materials for export; we think it equally necessary to do the same in the case of manufactured articles or materials imported. We may quote, without entering into details, the instance of sugar, the increased import of which coincided with the reduction of rates brought about by railway competition. Relevant points for consideration in such cases are how far the reduction benefits the ultimate consumer, or is appropriated, by the manufacturer or middleman; and whether any of these persons really needs the concession. We would, however, point to the necessity of one exception to this principle in the case of imports. Machinery and stores destined for industrial use in India should be transported at the lowest rate possible; this will repay the railways many times over in subsequently increased business in other ways.

Miscellaneous difficulties of industrialists.

276. There are other difficulties affecting industrialists, of which we received complaints. The shortage of wagons, the inconvenient routing of traffic, unnecessary breaks of gauge, losses from careless handling or from dishonesty, the question of risk notes and the like were frequently mentioned to us by witnesses, and are commonly discussed in the press by business men and by bodies interested. Into the merits of these questions we are neither prepared nor desirous to enter; but we are sure that the more effective representation with the Government of India of the industrial and commercial interests of the country by a department charged with the task of developing an active policy of stimulation and improvement, cannot fail to do good to the country and, therefore, in the long run to the railways also.

Representation of industrial interests with Government of India.

277. We recommend for the serious consideration of Government the suggestion that this representation might be increased by appointing a commercial member of the Railway Board. But it is well to add that the power of control possessed by the Railway Department over the railways is limited by contracts in the case

of company lines and so long as these subsist, the only action which the department can take is by way of argument or influence.

We have already stated that there will be more than one class of considerations to be taken into account in dealing with the future railway rate policy. In dealing with questions of overseas trade and the effect of a change of rates on the ability of Indian products to compete at the place of consumption with those from other sources, the Railway Department will doubtless be assisted by the department of Government in charge of commercial interests, which will have the advantage in future of a more efficient system of commercial intelligence, linked with that which is now being elaborated for the British Empire as a whole. In the settlement of railway questions affecting the requirements and production of Indian industries, the proposed Department of Industries should have a voice; and the provincial departments which we have suggested, with their industrial boards, would often take the initiative in such questions. No such organisation for the representation of local industrial interests and the effective presentment of their wishes before the Government of India has existed hitherto, and it is owing to its absence that the claims of industry have not, as a rule, been put forward effectively and authoritatively. The interests of Indian industries and commerce should, we think, be represented at the Railway Conference and at the meetings of the Goods Classification Committee by appropriate officers of the imperial and provincial Departments of Industries, and in particular by the Director of Commercial and Industrial Intelligence, as well as by representatives of British and Indian commercial bodies. We think it beyond our province to discuss how far, if at all, the relations which exist between the railways and the Railway Department of the Government of India would require modification to render effective the policy which we recommend.

How far individual concessions should be given to industries.

278. We have, we trust, made it clear that we advocate no one-sided policy of administering the railways as a means of subsidising industries, irrespective of financial considerations. We think, however, that favourable consideration should be given to new industries, in cases where the investigations of the Department of Industries show this to be necessary, by the grant of low rates for a term of years. But we would again repeat, that the abolition of inequalities which we recommend would undermine many of the present complaints.

Water Transport.

279. We have examined a number of witnesses regarding the question of river transport, which is especially important in Bengal, Burma and Assam. We were unable to arrive at definite conclusions. We fully accept the desirability of the improvement of many of the existing waterways; but the matter really turns on the cost of the improvement in relation to the results to be obtained in the case of each scheme, and on the merits of these we are unable to express an opinion. We feel

justified, however, in urging that the Government of India should take up the question of improving the existing waterways, as we cannot help thinking that, in the absence of a representative specially charged with their interests, the vested interests of railways have prevented waterways in India from receiving the attention that has been given to them in other large countries with such satisfactory results. The proposal to form a Waterways Trust was prominently brought to our notice at Calcutta, and although we cannot give an opinion on its merits, the prospective advantages seem to be such as to merit the early consideration of Government. If our suggestion be accepted, that the control of communications should be separated from that of industries, the simplified Department of Commerce should be in a position to give greater attention, not only to the utilisation of existing waterways, but to their improvement with the view of increasing the number of channels of internal trade.

We consider it essential that railway and waterway administrations should work together harmoniously for the development of those parts of the country which are served by both, and we commend this question, together with that of coastwise freights, to the attention of the future Department of Commerce. The effect of shipping freights, coastwise and oversea, on transport, although we are well aware of its importance to the trade of the country, is a matter in regard to which we do not feel called upon to make any specific recommendations.

CHAPTER XX.

Industrial Finance.

Attitude of Indian capital towards industrial undertakings.

280. A detailed examination of modern industrial enterprise in India discloses the fact that, while during the last half century there has been considerable progress in respect of the investment of capital, it has been upon comparatively restricted lines and there has been little enterprise in new directions. In consequence, the major industries of India are few in number and have been till recently chiefly confined to the textile and leather industries and to mining.

During the last few years, however, there has been a very marked broadening of the field of industrial activity, as exemplified by the establishment of the iron and steel works at Kulti and Sakchi, various Portland cement works, the hydro-electric installations in Mysore, Kashmir, and on the Western Ghats, and the extension of the use of electrical energy to a number of large towns. A number of further schemes are to come, and we may expect to see, in the immediate future, far greater utilisation of the water-power possibilities of the Western Ghats; large additions to the existing steel works; the creation of a group of subsidiary concerns to convert the output of the steel works into manufactured products; the smelting of zinc and copper and the production of sulphuric acid on a large scale; the treatment of coke by-products and the production of "heavy" chemicals on a modern basis; the manufacture of textile machinery and mill accessories; the building of steam and oil engines. Some of these projects are under construction; others have been fully worked out and financed, and are ready to be taken up at the close of the war; others again are being investigated by powerful interests. There has been much development in mechanical engineering, due chiefly to the increased needs of the extending railway system and to the general growth of public and private enterprise. This movement has been, however, arrested by the war, which for a time rendered capitalists afraid of new ventures, and has latterly made it impossible to obtain plant, machinery and staff.

Capital in the mofussil.

281. We may now consider the extent to which capital to finance new enterprises is available in India. On this subject we have received a large amount of evidence, an analysis of which yields the following facts. There is a considerable accumulation of capital in India, and to this new savings are being added every year. Some part of these savings is invested directly in the extension of industry. But we must again draw attention

to the vast differences in the economic conditions which prevail in different parts of India. Banking facilities do not exist at all for the great majority of agriculturists, and the co-operative credit movement is only in its infancy. Even where branches of banks exist in mofussil towns, they do not unfortunately attract the custom of the small trader or of the agriculturist; nor do either of these, under existing conditions, possess the confidence of the banks. The often illiterate agriculturist views with considerable doubt the deposit side of a bank's business, while the security that he can offer, though good of its kind, is, owing to his unbusiness-like methods, far less tempting to a bank than the business offered by the larger tenant farmers in other countries.

The agriculturist, the rural artisan and the small trader are financed by the *mahajan*, who does not confine his dealings to money, but is often also a purchaser of local products and a dealer in imported articles. He either operates with his own capital, or is helped by a bigger man of his own class; and the latter often has dealings with banks on a considerable scale. The *mahajan* charges high interest; landed security is good, but is not easily or rapidly realisable; debtors are uneducated and have no idea of business methods or of punctuality in meeting their obligations; their income is often precarious, depending as it does on the nature of the season; and, partly in self-protection, the *mahajan* charges a rate of interest which local custom readily tolerates. The larger *mahajans* who finance landowners or regular traders, often lend money on cheaper terms. But even they do not consider that organised industries, except a few well-known and well-established ones with the value of which they are fully acquainted, furnish acceptable security, and when they lend to others, they exact heavy interest. It is only the smaller industrialists who crave the assistance of the *mahajans*. The larger concerns go to the banks.

282. Thus, except for the branches of presidency and joint-stock banks and a few local banks, such capital as exists in the mofussil is unorganised, and the transfer of money is a personal transaction between the payer and the recipient. There are very many small towns, each of which carries on considerable business under these conditions and without the aid of banks. The volume of business would often be considered sufficient to warrant the establishment of a branch bank in the case of similar towns in Europe or America, where such banks sometimes open only one or two days a week. But there is in India at present a lack of trained bank employés, owing to the absence in the past of facilities for commercial education and of any regular system of training Indians in banking work, while the country folk do not yet realise the advantages to themselves of organised banking. For these reasons, the extension of banking in the mofussil has been slow. Where, as in the case of the Punjab, too rapid progress was made, it was attended with grave risks and followed by disaster. There was mismanagement at the headquarters of some of the banks, and many of the branches did little but receive deposits.

Those who invest their savings find few fields which are at once safe and attractive. Investments in land by purchase or mortgage still appeal most strongly to the Government official or professional man; and the farmer with spare funds cares for little else, except in a few parts of the country where some form of industry, usually of a simple type, has become recognised as a safe investment. The Post Office Savings Bank attracts deposits from the intelligent middle classes in towns, including Government servants; and to some extent Government paper also has found holders among the same classes, as well as amongst the bigger landholders.

283. The employment of wealth by those agriculturists who possess it follows traditional lines. In those parts of India where excessive subdivision of land is not the rule, well-to-do agriculturists are found owning a fair quantity of jewellery which is worn by their womenfolk, and they keep in addition a certain amount of rupees or sovereigns, a part of which is used for the current expenses of their household and of their cultivation. The rest they hoard against anticipated future necessities or lend to their neighbours. After the harvest, the money which they have lent or expended on their cultivation comes back to them. This seasonal employment of money leads to two results; the locking up of money unproductively during the slack season, and a high rate of interest during the busy period, because money can be used only for a few months, and during these months it must earn a high rate of interest in order to yield the average return which would normally be available from long-period investments.

In some mofussil areas, small industrial undertakings are started by individuals, family groups or syndicates. But a sense of business proportion is lacking; in certain parts of the cotton tract, the number of ginning factories and baling presses is far beyond the requirements of the crop; and in the great rice-growing deltas of the Coromandel Coast and in parts of Burma, the number of small rice mills established in recent years has rendered barely profitable what was, at the outset, a flourishing industry.

Capital in Presidency towns.

284. We may now describe the state of affairs in the presidency towns where a much larger proportion of the exchanges takes place through banks, and there is greater readiness on the part of some sections of the public to invest. The representatives of well-established firms, European and Indian, who have come before us as witnesses, generally testify to the fact that they themselves experience comparatively little difficulty in obtaining capital for any well-considered proposals which they are able to put forward. The Bombay Advisory Committee are of the opinion that the shyness so often attributed to capital in India does not exist to a marked extent in Bombay city and probably not in the Bombay Presidency. But, speaking generally, and this remark applies even to Bombay, there is a complaint that the existing banking system is too inelastic, and is insufficient to meet the needs of the country, and

that, in respect of industries, development is greatly retarded because the banks refuse to advance money for lengthy periods on the security of buildings and plant. However, in the words of the head of a presidency bank :—" The business that a presidency bank may undertake is strictly confined within certain limits laid down in the Banks Act, and the underwriting of industrial capital and investing in, or lending on, the security of shares in industrial concerns do not come within those limits." We have received evidence in favour of a relaxation of the restrictions of the Presidency Banks Act which prevent loans from being given for longer than six months, and require the security of two names. Practically all the other banks of established reputation, English and Indian, work on more or less the same lines, and the attempt in the Punjab to introduce banking on industrial lines failed, owing, among other causes, to the attempts of the banks to finance long-term business with short-term deposits, and to the fact that they sank far too great a proportion of their funds in a single industry.

The financial difficulties of the small industrialist.

285. Whether in the presidency towns or in the mofussil, the difficulties in obtaining loans and financial assistance which are felt—and of the reality of these we had plenty of evidence—are experienced chiefly in the case of the middle-class industrialists, who are unable to offer the security of approved names, or of stocks which could be readily disposed of. Indians suffer in a special degree from this deficiency ; for, among other reasons, they find it difficult to satisfy a bank, whose directorate and superior staff are entirely European, as to their financial position. In this connection it has been strongly represented to us in some quarters that the inclusion of Indian directors on the Boards of the Presidency Banks would promote the extension of their business and increase the provision of facilities for Indian industrialists ; and we put forward this suggestion for the consideration of the banks concerned. There is no doubt that the small entrepreneur, whether industrialist or trader, is hampered seriously by the lack of banks and of finance at reasonable rates ; and that the extension of facilities has been far too slow and too limited to meet the needs of the country. On the other hand, such applicants for assistance are often unable to exhibit their financial position in a form intelligible to a banker.

Summary of position.

286. Such are the conditions of rural and urban finance ; and it is hardly surprising that, taking into account the general ignorance of industries, money for investment therein, whether on loan or by way of subscription to capital, is not readily forthcoming and the wealth actually possessed does a very small amount of work owing to its inactivity. There is a general demand for Government financial assistance, though there is no unanimity as to the form which it should take. It is stated plainly that the provision of Government funds for an industrial undertaking or a guarantee of interest on the part of Government will attract investors, chiefly because it is generally considered that when Govenrment gives assistance in this form and assumes any part of the financial risks, it will examine the

prospects of the undertaking and will be reasonably sure of success. In the case of small industries, and of those that are new to India, witnesses complained bitterly that the public are unwilling to invest, that sufficient capital cannot be obtained from the friends and acquaintances of the promoters, and that banks are unwilling to supplement the deficiency or even to provide working capital. Money for such purposes can only be obtained at a rate so high as to swallow up the profits of the venture.

The difficulty in raising capital for industries is mainly the measure, even in India, not of the insufficiency or inaccessibility of money, but of the opinion which its possessors hold of the industrial propositions put before them. We have seen that deficiency in business experience and practical knowledge of the technical details of an industry is often a more serious handicap in the way of its promoters than lack of finance. Thus we found in many cases that, where there were complaints of inability to obtain sufficient capital there had been also initial miscalculations as to cost of buildings and plant, or as to the amount of working capital needed. In other parts of our report we have formulated proposals for placing technical assistance and business advice at the disposal of industrialists; we have now to see whether it is desirable for Government to take any steps towards rendering finance available, whether for initial or working capital.

Industrial Banks.

287. Where industrial enterprise is in a healthy state, opinions seem to be crystallised in the evidence tendered to us by the Bombay Advisory Committee, who state, "We favour the establishment of a central industrial bank or similar organisation with a large capital and numerous branches, designed to afford financial support to industries for longer periods and on less restricted security than is within the power or practice of existing banks. Such a bank would probably require a measure of Government support, but should not be brought under rigid Government control."

The only instance of an industrial bank in India is the Tata Industrial Bank, which was established quite recently and has not yet had time to evolve a systematic policy in dealing with industries, or even to illustrate the possibilities and difficulties of this interesting form of financial activity. Our information regarding the British Trade Corporation, which, however, undertakes other lines of business than industrial banking, is confined to the report of the Committee which recommended its inception and to the many criticisms which have been put forward in Parliament and in the public press on the report and on the terms of the charter, and no actual working experience is available as a guide.

Industrial Banks in Germany and Japan.

288. We have examined such material as we were able to obtain regarding the part played by banks in the industrial development of Japan and Germany. In the latter case, a compendium of the

statistical position will be found in a note by the Director of Statistics printed among our records.* The characteristics of the great German industrial banks are, briefly, the high proportion of their paid-up capital to their total cash transactions; the readiness with which they finance industrial and commercial business and participate in fresh industrial ventures, by taking up and eventually selling blocks of shares in such undertakings; and, finally, the large extent to which they retain a control of the industries and businesses which they finance, by appointing their representatives as directors. They have thus been able to make such undertakings help one another and, therefore, the bank; and have at their disposal the wide range of technical knowledge and experience of these assisted businesses to aid them in deciding on the merits of further undertakings. It is alleged that behind these banks stand the Reichsbank and the German Government.

We have recorded evidence on the Japanese banking system, which explains the methods on which the large banks purport to do business. We may consider, as a specimen of these, the case of the Nippon Kogyo Ginko, a Japanese industrial bank, with a Government guarantee of limited duration. The by-laws of this bank, which require Government sanction, forbid the loan of an amount exceeding half of the bank's paid-up capital on urban land or industrial buildings; its debentures may not exceed the value of certain securities held by it, or be more than ten times the paid-up capital; and the bank must not give loans for longer periods than five years. We find thus in Japan a considerable degree of State support and control in the case of banks which are designed to assist the commerce and industry of the country. We were unable, however, to form opinions of value on the effect of these methods in actual practice, and, though we received some information regarding the mutual support obtained by industries through the gilds, we have no precise details as to the extent to which the local banks afford assistance to small industries, a function which, so far as we could ascertain, is not undertaken by the larger banks.

Industrial banks: their possibilities for the assistance of industries.

289. We have now to consider what is the best class of agency for the provision of initial and current finance for industries. The industrial trust or financial corporation for the promotion of industries, which some witnesses supported, is, we consider, in its nature too directly concerned in the success of particular undertakings to be a suitable instrument for the general advancement of industries, though a useful agency for furthering particular industrial interests. The multiplication of concerns in any industry to which it is already committed, will not be welcomed by it. The industrial bank, on the other hand, if wisely conducted, is benefited by an increase in the number of individual undertakings, and it can to some extent prevent their extension beyond the safety point. It is true that in a country like India, where a wide industrial basis does not at present exist the

* Minutes of Evidence Vol. V.

specialised business opinion and expert advice required by industrial banks are only available to a limited extent; but the latter can be, to some extent, provided from the Government establishment which we have proposed, subject to the conditions laid down in paragraph 127 of Chapter IX. We are not blind to the dangers which attend the giving of advice on an industrial proposal by the Government officer or department; but we feel confident that the successes will so greatly outnumber the failures, that the general results of such a policy will be advantageous. It is impossible for a bank to retain in its permanent employment a sufficient number of first-class experts to advise it on a great diversity of new industrial undertakings, while, if it confines itself to financing those as to the soundness of which it is able to satisfy itself, its activities will be too restricted to enable it to earn a profit on its necessarily large capital; and it may even have to limit its investments to so small a number of industries as to endanger its own stability. It appears to follow that an industrial bank with a sufficiently large capital to ensure its safe working must, at any rate for some time, combine ordinary banking business with its industrial activities to enable it to obtain a return on its capital. But it cannot be too strongly emphasised that, in such a case, the clearest possible distinction must be drawn between industrial finance and ordinary banking business. Share and debenture capital and long-term deposits may legitimately be used for the former purpose, but short-term deposits never; and any attempt so to employ them should be most strictly prohibited, if necessary by law.

290. Judging by the information available from Japan and Germany, an industrial bank can assist in the provision of initial capital, either by examining proposals for starting new concerns and allowing their prospectuses to issue with its *imprimatur*, or simply by providing them with money. This again may be done either by loan or by the purchase of shares.

The provision of working capital for industries that have been started is undertaken by existing banks, but few of these lend money on the security of plant and buildings, or reach the smaller industrialist who most needs help, even when he can offer personal security or a lien on actual goods. An extension of facilities to meet these cases would be of the greatest assistance to small and middle-class industrialists.

What is required, then, is a bank which can keep in touch with small industrialists, is able to estimate the prospects of a fairly extensive range of industries, and possesses funds which it can afford to lock up for a time in securities not readily realisable. A bank that is so equipped will often be able, even if it has in the last resort to take over a factory, to avoid much of the loss which such a course would usually entail on an ordinary bank. It is clear that a limit will have to be placed on the amount advanced on security of this kind, and this should be fixed with special care in the case of money advanced towards initial capital. Plant has, in some cases, a sale value which can be estimated with a considerable degree of certainty; it then constitutes a fairly liquid asset.

291. We are of opinion, therefore, that an industrial bank should possess a paid-up share or debenture capital high in proportion to its total business; it should observe the usual precautions in not allowing too large a share of its funds to be used for the benefit of any single interest or group of financially inter-dependent interests; its loans on plant, buildings and land should be carefully considered and should be limited in each case; the larger portion of its industrial business should be confined to the provision of working capital; it should provide initial capital with caution, at any rate during its opening years, and should not itself at first attempt to float companies, though it may advise and assist in other ways persons who propose to do so. The main factor of safety in an industrial bank is the judicious limitation of each class of business to its proper proportions.

Appointment of expert committee proposed.

292. We have shown that the lack of financial facilities is at present one of the most serious difficulties in the way of the extension of Indian industries, and we believe that industrial banks, especially under the improved conditions towards which the measures proposed by us are intended to lead, would be a potent means of removing these difficulties and of affording help to industrialists. The Tata Industrial Bank has recently started, with a large capital raised without Government assistance; but we think that there is still ample room for other institutions, especially of a type designed to afford assistance to smaller industrial undertakings. Although, as we shall explain below, there will be cases, particularly at first, in which direct Government assistance should be given to industrial undertakings, we are of opinion that work of this kind can be performed more suitably by private agency, and that Government should hand over all such business to suitable banks as soon as circumstances permit, and should frame its policy with this end in view. We consider that the establishment of industrial banks working on approved lines is of sufficient national importance to justify Government assistance; but we do not feel that we have sufficient material before us to enable us to formulate a definite scheme for industrial banks, whether of provincial or imperial scope. We ask, therefore, for the appointment at the earliest possible date of an expert committee to consider what additional banking facilities are necessary for the initial and for the current finance of industries; what form of Government assistance or control will be required to ensure their extension on sound lines as widely as possible throughout the country; and whether they should be of provincial or of imperial scope, or whether both these forms might not be combined in a group of institutions working together.

Other Measures to provide Financial Facilities.

Provision of current finance for middle-class industrialists.

293. We recognise, however, that the adequate extension of industrial banks will be a matter of time; and we have therefore considered a proposal to meet the need experienced by middle-class industrialists for current finance, a proposal which could,

it would seem, be readily merged in any future system of industria banking.

As we have already explained, the banks have no convenient agency for enabling them to ascertain whether the proprietors of small industrial concerns are working on sound lines and possess a good reputation for honesty and punctual payment. The proposal represents an attempt to supply this deficiency and to bring such men more and more into touch with banks of repute. The scheme would, in the first place, be confined solely to industrial businesses with a paid-up capital of from Rs. 5,000 to about Rs. one lakh. The provincial Director of Industries, assisted by his technical staff and by the advice of a committee of business men, among whom a representative of the lending bank might well find a place, would examine the financial position and reputation of applicants and their methods of manufacture, and would certify those persons whose position was found satisfactory, as suitable recipients for a loan. This would take the form of a cash credit for a definite period and amount with a bank. Government would, under this proposal, guarantee the principal sum lent with interest at a rate to be agreed on with the banks. Any bank of repute would be allowed to participate in the scheme, and applicants would select the bank with which they would deal. Suitable limits, both maximum and minimum, would have to be fixed for the cash credits. The rate of interest to be paid by approved applicants would be a matter for Government to decide. The latter might perhaps desire a rate somewhat higher than the rate guaranteed to the bank. Some portion of this margin could then be retained by the bank for its trouble, and the rest be used by Government as a set-off against possible losses. If interest at a rate higher than the bank rate were levied, the bank would find in this an inducement to take over an increasing share of the business, free of Government guarantee. By doing this, the bank would receive the whole of the interest charged, instead of having to hand over some of it to Government. Similarly, if a certified applicant failed to pay his debt, the bank would only receive from Government, in addition to the principal, the guaranteed rate of interest; and the bank would naturally do its best to avoid the loss of its share in the interest in excess of this, by watching the way in which the account was operated and reporting to the Director of Industries anything which showed that action on his part was needed.

It is clear that the success of the scheme would rest almost entirely on the qualifications of the Director and on the nature of the organisation which he would have to create in order to determine the suitability of applicants for help. We recognise also that, as a general rule, the task of ascertaining the soundness of a concern asking for financial aid can be best performed by a banker, and can only be undertaken by Government at some risk. But we have so strongly before us the difficulties experienced by the middle-class Indian industrialist in obtaining financial assistance from existing banks, that we think the scheme deserves consideration, at any rate as an interim measure until industrial banking

facilities can be extended. The same principles apply with even greater force to any organisation for the supply of initial capital to industries.

Circumstances in which Government financial assistance may be given to large industrial undertakings.

294. There are, however, still likely to be cases requiring help, which cannot for various reasons be reached by banks, and will need direct Government assistance. We have already indicated the extent to which Government should assist nascent industries by expert advice, by experiment, by demonstration and pioneering; and we may point out that Directors of Industries and their staffs will often be in a position to assist and advise small industrialists regarding the keeping of their accounts, and the form in which they should place their business position before banks from whom they wish to borrow. We consider that preliminary investigation and expert advice by Government will inspire confidence and render possible the starting of many industrial enterprises, for which in existing circumstances private funds are not forthcoming. But there will still, we recognise, be occasional cases in which this will not be so, and more direct Government aid will then be asked for. The advisability of giving such aid depends on the extent to which the starting of the enterprise in question will be of benefit to the public, and not merely on its probable advantage to the promoters of the industry. Thus, the starting of a new or the improvement of an existing industry, when such a measure is required to supply an existing deficiency in the interests of national safety, is clearly a case for direct aid. There may also be a few cases where a new industry or process will have such an important bearing on the economic development of the country as to deserve Government help. Finally, it may even be found that the extension of an existing industry to a new locality will benefit local consumers or producers so markedly as to merit Government assistance. We think that in the majority of instances private funds will be forthcoming without direct Government aid, to finance proposals put forward under any of the above conditions, if Government advice and technical assistance are freely utilised. But where private enterprise is unable to obtain funds without Government aid, and where, with such aid, prospects are promising, we think that, in the circumstances described above, it should be given. Financial aid of this kind, if for undertakings required in the interests of national safety, should be solely a matter for the Imperial Government; in other cases, it should, subject to their general powers of financial sanction, be within the competence of Local Governments, where they possess the necessary expert staff. In practically all cases of Government aid to an industrial enterprise, action is necessarily to some extent experimental, and favourable results may be of great importance to future undertakings as well as to Government. We have noticed that in a few instances in which Local Governments have granted aid to industries, conditions were not so arranged as to permit of reliable inferences for future guidance being drawn from the results attained. It is, therefore, essential that, with due regard to the interests of the undertaking itself, any such experimental measures

should be as far as possible crucial, as regards both conditions and scale of working. Principles will be thus ascertained and a definite policy established, which should render possible a still further degree of delegation in favour of Local Governments.

Nature of Government financial assistance to large industrial undertakings.

295. Government assistance may take the form of guarantees of dividends of loans of money, or of undertakings to purchase output, as may appear most suitable in each case. Thus guarantees may be appropriately given in the case of large industries, in which the dividend-earning stage is likely to be reached only after a comparatively long period. As a general rule, any sum paid by Government by way of guarantee should be refunded from the subsequent profits of the enterprise, when these have reached a certain predetermined percentage; and the guarantee should be only for a limited number of years, and at a somewhat higher rate than that which Government paper can be bought to yield. Loans are especially suitable in the case of concerns with assets of a comparatively liquid nature, but need not be confined to these, if Government is fully satisfied as to the prospects of the undertaking. Agreements to purchase output may be freely given to concerns manufacturing articles not previously made in the country, and, in other cases, with greater caution and with due regard to existing interests in India. Such agreements should be limited in point of time, and should be accompanied by suitable conditions as to quality and price. The output must, of course, be of articles which Government requires for its own purposes. There may be a few industrial ventures which Government may consider of importance to national safety, but does not desire to undertake by its own agency, though it thinks it necessary to have a continuous and effective voice in their management. In such cases, especially where sufficient private capital is not forthcoming, Government might contribute directly towards capital resources as a shareholder. The general effect of the measures suggested will be greater and will be in the direction where it is most needed, if ventures of moderate extent receive preference and the requirements of comparatively undeveloped districts are not overlooked.

Government supervision in such cases.

296. Before giving assistance which involves a charge on the public funds, Government should satisfy itself regarding the financial status of the promoter and the economic and technical aspects of the proposed industry. The latter information may be collected either by Government or by the promoters, so long as the agency employed is of a nature to command confidence. Where any form of Government financial assistance is given, we consider it desirable that Government supervision should at least include audit and inspection, and that it should be secured by suitable agreements that the objects aimed at by Government will be fulfilled; also that, where guarantees are offered, unfair encroachments on the earnings of the undertaking should not be permitted to other interests.

297. In certain cases it may be desirable, especially in the early stages of an undertaking, to appoint a Government director, who need not, however, be an official. We realise that in the case of railways, where a well-established policy has been developed as the result of years of experience, a Government director can safely be allowed to exercise the power of veto; but in the case of commercial companies, where promptness of action is essential, Government interference, unless on carefully adjusted lines, would be liable to cause delay, leading to very serious losses. Ordinarily, therefore, we consider that the functions of a Government director should be limited to reporting to Government the action contemplated or taken by the company where it is of a nature demanding Government attention and that he should not have to refer such action for sanction.

Appointment of Government directors.

298. We consider that, where industrial undertakings receive Government aid, *e.g.*, by way of guarantee or subscription to share capital, their capital should be raised in India in rupees. In order to secure that the opportunity of subscribing to such undertakings is fully open to all classes of the public, we think that Government should control the allotment of shares, for example, by formulating rules designed to give an opportunity to small investors of joining in industrial enterprise, and to induce the Indian public to take any interest in industries.

Raising of capital for aided companies.

299. Similarly it is desirable in such cases for Government, so far as the circumstances admit, to obtain some *quid pro quo* for its assistance, which may take the form of an undertaking to sell certain products to Government at a favourable rate and within certain specified limits of quantity, if required; to give priority to Government orders in certain circumstances; or to accept a certain number of apprentices.

Undertakings by companies in consideration for Government assistance.

We wish to make it clear that the foregoing remarks are to be taken in the nature of general suggestions; rigid prescriptions are undesirable, seeing that in the early stages of a new policy the activities of Government must naturally be regarded as experimental, and should therefore not be unduly fettered by hard and fast rules, the object in view being to foster industries with the minimum amount of Government assistance or interference.

300. There is a general consensus of opinion that there should be no limitation on Government aid to a new enterprise, on the ground of its competing with an established external trade.

Enterprises in competition with foreign concerns.

301. Assistance may also be given by way of loans to small or cottage industries and to co-operative societies. This class of loans should be made by the Departments of Industries to persons or bodies whose financial position and character are found on-

Special recommendations regarding Government loans to small and cottage industries.

local enquiry to be suitable. Other forms of security than landed property might be accepted, but in such cases a stipulation should be usually made that applicants should find a fair percentage of the total outlay from their own resources. The advice of the members of the Board of Industries or of its local or special committee as to the financial standing of an applicant for a loan would be of value and would usefully supplement local enquiries. We have already stated that all schemes for Government loans to industries should be worked with the object of handing over the business to a suitable banking agency in due course, and the interest on these loans should accordingly be fixed at a rate which would render this course possible.

It should be a condition of the loan that it should be spent on approved types of plant and the department itself might, when desired by the applicant, purchase the plant. There are numerous types of plant suitable for the purposes of agriculture or of small industries, which could be made available by Government on the hire-purchase system. This system has already been followed with some degree of success in Mysore by the State Department of Industries, and by private concerns elsewhere. We print as Appendix M the rules for hire-purchase in force in the Mysore State, as an instance of a mechanism which experience has shown to be effective.

302. We consider that some maximum limit must be placed on the amount of individual loans advanced and on the value of plant supplied, under this system, but it would be for the Local Government to determine the figure to which the powers of the Director of Industries should extend. We are further of opinion that advances of this kind, whether in cash or by way of hire-purchase, should be made under a special Act providing suitable means for the recovery of outstandings In the absence of such provision, the difficulty of recovery will tend unduly to restrict the giving of advances. The Land Improvement Loans Act and the Agriculturists' Loans Act do not cover the granting of loans for purposes unconnected with agriculture, nor do they permit of the loan taking the form of plant made over to the recipient on a hire-purchase system. For these reasons, we think that fresh legislation would be required.

CHAPTER XXI.

Provincial Departments of Industries.

Recapitulation of previous proposals.

303. We have shown in preceding chapters that the economic development of India has been very incomplete, and that its numerous deficiencies have left her exposed to disadvantages and dangers from which a proper organisation of her resources and workers would make her free. This end cannot be achieved, in the peculiar circumstances of the country, without the adoption of a national policy of industrial improvement, covering a number of parallel lines of advance which have been explained in detail. We have drawn attention to the necessity of technical and industrial education, and we have recommended a comprehensive scheme to meet the needs of the leading industries. We have indicated the extent to which the country suffers at present from the lack of organisation among scientists, and we have made general suggestions for remedying this deficiency. We have pointed out the improvements which require to be effected in the Agricultural and Forest Departments and in the Geological Survey, to make them more useful to industrialists and to the country generally. Agriculture is our most important industry and, if conducted on more efficient lines, it will not only supply a greater range of raw materials to industrialists, but will set free some share of the labour which it is at present employing in a wasteful manner. We have discussed the sources of power which exist in India and have made suggestions for their more economical and efficient utilisation. Perhaps the most important of our proposals are those relating to industrial experiment and research, and to technical assistance and advice to industrialists, and we have explained in some detail the different forms that these must take in the case of both cottage and larger industries. The organisation proposed for the aid of the former will require to be supplemented by a system of finance by Government and by co-operative agencies. To meet the financial needs of the larger industries we have made separate suggestions. We have proposed that the purchase of Government stores should be conducted in a way which will encourage manufactures in this country, and we have also pointed out the necessity of an improved system of commercial and industrial intelligence. We have made a number of incidental suggestions regarding such matters as transport, land acquisition and the mining rules, which will, we hope, smooth the path of industrial progress. We have discussed the general position of industrial labour in India, and have tried to show in what ways its efficiency is affected by the surroundings in which it lives and works, and how far these can and should be improved.

304. To carry out these suggestions in the first instance and to maintain the ground won, we require a specific organisation, properly equipped for the purpose, whose duty it will also be to keep a constant watch for industrial developments abroad that may menace the interests of India, and to see that such assistance as can be afforded is not lacking to our industries in their struggle against outside competition. We must emphasise the extensive nature of these proposals, each one of which will involve heavy responsibility in direction, which can only be discharged with the aid of the best expert advice, executive work on a wide scale requiring a numerous staff for its performance, and the expenditure of large sums both by Government and the industrial public.

We are proposing measures designed to assist existing industries, in which many crores of rupees are invested, and to build up new ones which may become of equal importance, with the object of making India self-sufficing both in respect of her industries and of the expert staff which they require. These far-reaching aims can never be achieved without a great effort, in which both the Government and the people must fully co-operate; and for this co-operation we have provided. So far as Government is concerned, the main share of the work will fall to provincial administrations, but in the interests of economy and efficiency alike, some important duties will have to be performed by the Imperial Government, and the latter will, in any case, be responsible for the success or failure of the policy, of which it must assume the general direction.

Shares of Imperial and Local Governments in industrial policy.

305. We have already indicated the shares that will have to be borne in this work by the Imperial and Local Governments, respectively. The control of technical and industrial education, except in the case of two central institutions, one for the highest class of instruction in engineering, the other for metallurgy and mineral technology, for which we think a necessity will sooner or later arise, will lie entirely with provincial Governments, though we contemplate certain advisory functions being performed by imperial agency, to ensure this form of education being maintained on sound lines and to avoid the numerous errors of the past.

By far the greater number of the members of the Chemical Service, which is the one most intimately concerned in industries, would according to our recommendations be placed under the orders of Local Governments, and the Imperial Government would then be concerned merely with questions of the recruitment, promotion and distribution of the staff, and with fundamental research. We have proposed no alteration in the existing allocation of responsibility in respect of the Agricultural and Forest Services, nor in the case of the Geological Survey. In Chapter XIV we have shown that a limited number of special cases exist, where, in the interests of economy and efficiency, the initial measures must be taken by the Imperial Government. But in most cases this work would be done by provincial Governments, who would, as a rule, be responsible for the practical application of the results of investigations, whether

carried out by themselves or by the Imperial Government. We have proposed that commercial and industrial intelligence should be collected and utilised in the first instance by the provincial Departments of Industries, which would transmit the information to the Director of Commercial and Industrial Intelligence. The purchase of stores would be dealt with initially by provincial departments, but there are certain important materials which must obviously be purchased by a central agency, and this will, in any case, be required for the distribution of provincial demands that cannot be satisfied locally.

The administration of certain Acts and rules affecting industries, such as the Factories Act, and the Mines Act and Mining Rules, should be controlled by an imperial department, as at present, to avoid inequalities of treatment which would operate unfairly on industrialists in different parts of the country, though the necessary executive work would continue to be done entirely by Local Governments. In respect of financial aid to industries, we have proposed that loans to cottage and small industries, when necessary, may be made by Local Governments; while we think that larger-scale finance must be for the present provided by private agency, though we contemplate the grant of Government assistance in special cases. The welfare of industrial workers must be entirely a provincial concern.

Departments of Industries have been formally sanctioned by the Secretary of State in some provinces (Madras and the United Provinces), and in most others tentative measures of a similar character have been taken by local administrations.

We think that the recapitulation of our proposals, which we have given in this chapter, will show that the responsibilities of provincial Governments in respect of industries can be successfully discharged only through provincial Departments of Industries, which should be controlled by Directors of Industries. In these conclusions we are supported by the almost unanimous opinion of the witnesses who gave evidence before us.

Work of Provincial Departments of Industries.

306. The work of provincial Departments of Industries should fall under the following heads :—

(a) The direct encouragement of industries, including a large share in industrial research work, the provision of technical advice and assistance to industrialists, the examination of applications for special concessions, and the grant of loans to small and cottage industries.

(b) The collection and distribution of commercial and industrial intelligence; the work of passing Government indents and of purchasing and inspecting certain classes of Government stores; the organisation of markets for local products; the conduct of special enquiries and industrial surveys; the holding of industrial exhibitions and the management of commercial and industrial museums.

(*c*) The control of technical and industrial education. This would necessitate the training of staff for, and the inspection of industrial schools; the organisation and inspection of apprentice classes attached to large works, and the provision of the staff for the necessary theoretical teaching. The Director would also have to take his share in the control of the higher institutions for technical training. Funds for technical and industrial education would be provided from his budget.

(*d*) The control of the staff employed for the local administration of the Electricity, Factories and Boiler Acts; and the furnishing of advice to Government on the industrial and commercial aspects of the Mines Act and of the rules for mining leases and prospecting licenses.

We desire to draw attention also to the necessity for some means of exchanging information regarding the experience gained in different provinces. Even in respect of cottage industries this is necessary. We found at work in the local weaving institute of a certain province two types of looms, the use of which had been entirely abandoned, and for good reasons, in at least three other provinces which had tried them. We have made definite proposals to secure the exchange of information in respect of technical and industrial education and of the purchase of Government stores. As general measures, periodical publications, occasional conferences, both general and sectional, and inter-provincial visits seem the best means of doing what is needed.

Relations of Department of Industries with other departments.

307. We have further to consider what should be the relations of the Director of Industries with the Agricultural and Co-operative Departments. With regard to agriculture, the functions of the Director of Agriculture would naturally include the collection of intelligence of commercial value regarding the crops produced in the province, which he should communicate to the Director of Industries; though he himself should supply the essential information to the Director of Statistics. Agricultural engineering, including the demonstration to agriculturists of small power plants, should be under the control of the Director of Industries. In Bombay, where until recently (1918) there was no Director of Industries, this work was controlled by the Director of Agriculture; a similar course is, it is understood, contemplated by the United Provinces and Punjab Governments; and the Madras Government in 1916 placed the Pumping and Boring Department under the Director of Agriculture. The absence or comparative inactivity of provincial Departments of Industries can be the only reason for such a course. Where a well-equipped Industrial Department is actively at work, it seems a waste of control to have one department putting in power plant for agricultural work and another for other small industries, side by side in the same district. The work itself is of a totally different character from that which properly belongs to the Agricultural Depart-

ment, and valuable adaptations and improvements are not likely to be forthcoming except from a technical department which can control the work of industrial specialists.

The connection of the Director of Industries with co-operative work for industries has been discussed in Chapter XVIII. The intimacy of the relations between industrial improvement and agriculture has been emphasised in Chapter V, and we here again draw attention to the necessity of the provincial departments in question being so co-ordinated as to secure close and harmonious working between all of them. This, we think, may be best attained by placing them directly under the charge of a single high official, preferably a Member of the Executive Council. It is clear that the functions of the Departments of Industries will be both extensive and important, and that they will involve a serious increase in the responsibilities of Local Governments. Skilled control and an expert staff will be required, and full co-operation with industrialists and capitalists must be obtained.

Proposals for a Board of Industries.

308. For the proper control of its staff and the efficient conduct of its work, the department should be supervised by the Director, who should be assisted by a provincial Board of Industries, the members of which should be appointed by Government, in some cases on its own selection, in others on nomination by suitable public bodies. We have attempted below to work out a scheme which would be suitable for those provinces where a wide field of selection exists among persons engaged in large-scale industries and commerce. But we recognise that it may be desirable in other provinces, at any rate at first, to attach fewer powers and responsibilities to the Board.

Three main suggestions have been made :—(1) That the Director of the department should be an executive officer solely responsible to his Local Government ; (2) that the department should be controlled by a Board of officials and non-officials, and that the Director should be its executive officer and under its orders ; (3) that the Director should work under the orders of the Local Government, but should be assisted by a Board, of which he would be the Chairman. So far Madras has adopted the first method, and the United Provinces the third. No province has accepted the second proposal, and rightly so, as it seems to be unworkable. There seems to us to be no doubt that the third course should be generally followed. The Board should not be merely an advisory body liable to have its suggestions disregarded by the Director ; for it will be difficult to get responsible and competent men to serve on such conditions. In respect of all matters not specially excluded from its scope, it should be consulted, and in particular regarding the framing of the budget, the expenditure of budgetted funds and the appointment and promotion of the superior staff, but discipline and ordinary office routine, as well as such matters as the local administration of the Factories, Mines and Boiler Acts, should be left to the Director. Where the Board is in agreement with the Director, action may be taken within the powers dele-

gated to the department by the Local Government; where they disagree, the matter should be referred to the authority to which the department is subordinate. It is hardly necessary to add that the Director should not submit proposals to Government regarding questions in which the Board is concerned, without consulting it.

Composition and strength of the Board.

309. Some diversity of opinion exists as to the composition and strength of the Board. We consider that it should be mainly non-official. We do not think that it should be used to co-ordinate the work of the various other departments of Government which will come into intimate contact with the Department of Industries, such as those controlled by the Director of Agriculture, the Registrar of Co-operative Societies, the Conservator of Forests and the Chief Engineer. In our opinion, the Board should be a link between merchants and manufacturers and the executive authorities of Government who deal with their interests. It is, we think, worth while to recommend specially that adequate provision should be made for the representation of financial interests by the managers of banks or branches of banks established in the province. The post of Secretary to the Board should be filled by an appropriate officer of the Department of Industries.

The Board should be a small body, the size of which should not be less than six or more than twelve, according to the province. In the case of a Board appointed from the business community of a province, it would hardly be possible to appoint more than a single member with a knowledge of a subject like hand-loom weaving; and such a member might not be helpful in respect of other matters. The Board should, therefore, have power to co-opt members for temporary or special purposes and to appoint standing or temporary sub-committees, including persons from outside its own number, to deal with special subjects. We think that the development of the department would be facilitated by the formation of local or district committees which would be able to diffuse industrial information and would report to the central committee regarding matters of local interest. Further these committees should prove a powerful means of exciting throughout the province an active interest in the work of the department.

Payment of members of the Board for attending meetings.

310. It might be desirable to offer fees to the members of the Board and of the sub-committees and to grant them travelling allowances for attending meetings. This course is commonly adopted, not only in the case of the directors of limited companies, but also of the members of Port and Improvement Trusts.

Qualifications of Director of Industries.

311. The description which we have given elsewhere, and in particular in Chapter XIV, of the duties which the Director will have to perform, and the proposals which we have made in this chapter regarding his administrative position and the working of his department, will show that he must be a man with special qualifications. These include, in

the first place, business sense, *i.e.*, the capacity of appreciating the technical features of industries in their bearing on commercial possibilities, and the ability to form conclusions as to the commercial soundness of a scheme worked out by a technical expert; the power of organisation; familiarity with the practical handling of economic questions; and local knowledge. If such a man be also an expert in any industrial branch, this will be a great advantage. Men of the above type may be found either in Government service or among the commercial community. Officials will probably be somewhat deficient in their appreciation of the business aspect of industrial propositions and in their capacity for business management. Those of them who do not possess technical knowledge will be unable to add to or improve the suggestions of their technical staff, and it is not likely that they will be able to initiate new industrial proposals. Non-officials may or may not possess expert technical knowledge; but they are less likely to have wide local knowledge, while the best men among them may not be willing to accept the comparatively limited prospects of Government service. Our remarks in this chapter have special reference to the initial appointments, which will give rise to the greatest difficulty. Later on, Directors will be provided from the Imperial Industrial Service, if our proposals in Chapter XXII be adopted. For the first appointments, power of organisation must be recognised as a factor of special importance. If, then, a properly qualified industrialist or business man is not forthcoming, the balance of advantage in these cases is in favour of the selection of the Director from one or other of the existing services. But no undue delay should be allowed to elapse before replacing a non-technical man by a suitable member of the Industrial Service.

Relations of Director with Local Government.

312. We recommend that the relations of the Director and the Local Government should be as direct as possible, an end which may be effected by giving him the position of Secretary for commercial and industrial subjects. Proposals emanating from his department will already have been scrutinised closely by the Board of Industries; and it seems an unnecessary addition to have these further passed under review by Secretaries with no special knowledge or experience of the subject, though they should of course be examined in the Financial Department of the Secretariat and by the Secretaries dealing with other departments which may be affected by the proposals.

We have considered the arguments put forward on the other side. Some of them have been recapitulated in a parallel case in paragraph 48 of the Report of the Public Works Department Reorganisation Committee. But with reference to the views therein expressed, we think that the Director of Industries and his Board, dealing as they do with the economic and business aspects of a proposal as well as with its technical features, will not be exposed to the risk of taking a narrow departmental point of view.

We recognise also that, as pointed out by the Public Works Department Reorganisation Committee, the head of a department who is also

a Secretary to Government, may be to some extent prevented from touring. But we think that this objection has been overstated. Although the touring work of the Director of Industries is important, it is confined to the area of a single province, and his tours need not, owing to the nature of his work, be so prolonged as those of a Chief Engineer. Cases can reach him by post and be returned by him without undue delay; and between his tours he will have ample opportunities for personal discussion with the Member in charge or the head of the Government. He would, in any case, require, except in the smaller provinces, the assistance of a Deputy Director, who should be an officer as far as possible of the type which we have indicated as required for the post of Director, and this assistance would set him free from routine inspections.

We have also seen it urged that the scrutiny of a proposal by the Member in charge (or the head of a local administration without a Council government) and by his Secretary should be looked on as a single administrative act, performed for the sake of convenience by two separate persons. In practice, however, this arrangement involves noting by the ministerial subordinates of the Secretariat and by Under Secretaries, with a consequent waste of time; and we are of opinion that, if the Director of Industries and the Advisory Board do their duty properly, the case can be put before the responsible head as adequately as by a Secretary; while in the cases that the Secretary at present sanctions on his own responsibility, the Director should himself have the necessary powers. A large proportion of the proposals sent up by him will be of a nature that should be decided on purely commercial principles; and, with the opinions of the Director and his Board to help him, the responsible Member of Government should have ample materials for coming to a decision. The cases referred should not be numerous, if proper delegation of powers is effected.

Salary of Director of Industries.

313. We have already drawn attention to the difficulties that will face a Local Government in selecting a suitable man to fill the post of Director, especially in the case of the first appointment; and these, together with the important influence which the personality of the Director will exercise over the tone and methods of the department, warrant a substantial rate of pay, sufficient to attract a good man and to retain his services for a reasonably long period. The Director, at least in all but the smallest provinces, should be a man with long Indian experience, which should probably not be less than 15 years. Such a man, if in the Indian Civil Service and of abilities above the average—and these will be needed in such a post—will be in receipt of not less than Rs. 2,000 a month. Members of the other services would be drawing somewhat lower pay. A man who has started in commercial life without family or other interest would at that time probably be a junior partner in a business house, with prospects of a largely increasing share in the concern. We have already stated that the Director of Industries should hold the full status of a Secretary to Government. These considerations

seem to us to justify in the provinces of chief industrial importance, such as Bengal, Bombay and Madras, a salary of Rs. 3,000 a month, which might, in the case of a man taken from an existing Government service, be reached by incremental stages starting at a figure based on, but somewhat exceeding, his salary in the regular line, and graduated so as to reach the maximum in about 5 years. Further prospects in the imperial department also await a successful provincial Director. In the case of the less important provinces, the maximum salary might range between Rs. 2,000 and Rs. 2,500. We recognise that the nature of the work will vary greatly from province to province, and that the possible sources of recruitment will be numerous. We therefore think it undesirable to do more than indicate generally the limits of salary likely to be found suitable, leaving the Local Governments to work out their initial proposals to suit individual cases. To secure really outstanding men for the first appointments, it may prove necessary to give specially favourable terms, even in advance of those suggested above.

Salaries and duties of other officers of the Department of Industries; Deputy Directors.

314. A Deputy Director would be required at first in only the larger provinces; and he should receive a salary, which might suitably be incremental, beginning at Rs. 1,000 and rising to Rs. 1,500. Deputy Directors may, in the first instance, be recruited from Government services or from the commercial community, and later from the Imperial Industrial Service, as explained by us in the following chapter.

Industrial Engineers.

315. The industrial engineers who would be required in the provincial departments would be concerned mostly in the erection of small power plants and in advising on the erection of machinery in factories; specialist knowledge, where needed, would be provided, as a rule, by seconding special men from the cadre of the Industrial Service or by temporary appointments. They must be good all-round men with a wide range of practical experience. Men of the class required should be recruited in the first instance as explained by us in the next chapter, but they will need training and practical experience before they are fit to be placed on responsible work, As we point out there, the engineer staff should form the basis from which our proposed Industrial Service will be built up, and for exceptionally qualified men there would be prospects of rising to administrative rank.

Chemists.

316. The work of Chemists in the provincial departments will be mainly of an analytical character, and men with adequate qualifications can be obtained on salaries of Rs. 300 rising to Rs. 500.

Circle Officers.

317. To carry on the current duties of the Department of Industries throughout the province, it would be necessary to create a number of territorial charges, the size of which would depend on the work to be performed. Each should be supervised by a circle officer, whose duties would comprise the general supervision of all but the most important local activities of the depart-

ment. He would be its representative on the spot and the channel of communication between the people and the department. He would receive requests for assistance, make local enquiries, prepare schemes and supervise minor works. He should invariably be an engineer with a general experience of industrial work. Such appointments could be filled best by local men, who are more easily able to establish friendly relations with the people and can tour more freely among them. Their salaries should generally range between Rs. 200 and Rs. 700.

Intelligence work.

318. A senior office assistant on Rs. 500 or thereabouts would be required in all but the smallest provinces to collate and keep up to date the commercial and industrial information furnished to or collected by the Industrial Department, and to supervise the office work in connection with the checking of indents and the purchase and supply of stores.

Tabular statement of staff.

319. We give below a statement showing the officers who would constitute the superior staff of a Department of Industries in one of the larger provinces. Some of these would be officers drawn from the Industrial and Scientific Services, and the remainder would be either experts on temporary agreements, or officers recruited for the local Industrial Service, which each provincial department would require. The list is inclusive, and all the officers comprised therein might not be required in any one province at one time. We have formulated in the next chapter our proposals for the constitution of an Industrial Service, but, for the sake of convenience, we have anticipated these by indicating in the statement the officers who would ordinarily be members of that service.

Industrial Service.	Scientific Services.	Local Staff.		Special experts in
Director.	* Professors in technical colleges and schools.	Circle officers.	Supervisors (Erecting).	Tanning.
Deputy Director.		Superintendents of industrial schools who will be qualified experts in the main industry taught in the school.	Inspectors (Maintenance).	Glass.
Industrial Engineers.				Silk.
Principals of colleges.				Dyes.
Inspectors of Factories.				Oils.
Electric Inspectors.		Junior staff of technical colleges and schools.		Metal working.
* Professors in technical colleges and schools.				Electro-plating.
		Inspectors of Boilers.		Pottery.
		Assistant Mechanical Engineers.*		Ceramics.

* These will be sometimes engineers, sometimes industrial chemists, etc., and will act as experts and consultants in their special subjects.

CHAPTER XXII.

An Imperial Department of Industries.

Degree of responsibility attaching to the Imperial Government for the industrial policy of the country.

320. We have already explained that there will be certain industrial problems of importance common to more than one part of India, which in each case involve the employment of a comparatively numerous body of technical experts to investigate them, it may be on a commercial scale, and to propound promising solutions. These are sufficiently important and sufficiently correlated, both in themselves and in the public mind, to justify special treatment, and they involve interests which deserve separate representation in the Viceroy's Executive Council. They are more closely allied with manufacturing industries than with the production of raw materials, and we consequently see no reason for grouping them with Agriculture and Forests, which would thus remain, as now, associated with Irrigation, the administration of Land Revenue Law, the collection of Land Revenue and the control of the Veterinary Service.

It is thus a most important duty of the Government of India to provide the machinery required to ensure the uniform development that alone will make the country self-contained, both economically and for purposes of defence. From this point of view, India's most prominent present deficiencies are the absence of provision for the smelting of metals and consequent production of alloys, the manufacture of chemicals and the utilisation of the by-products of destructive distillation of coal and wood, the manufacture of rubber, now exported in a raw state, the preparation of foodstuffs for transport, the production of the better qualities of leather and the utilisation of the natural wealth of the forests for the recovery of drugs, essential oils and dyes. In addition to the production of these essential *materials*, the organisation on a large scale is also necessary of manufacturing operations for the production of *articles*, many of which will probably not be undertaken in the near future without some form of Government guarantee or support. This applies especially to the manufacture of electrical machinery and certain special forms of mechanical plant, such as internal combustion engines, machine tools and heavy steel forgings. In most of these enterprises it is obvious that only Government can be expected to give an effectual lead. Similarly, propositions for the development of hydro-electric power involve concessions either for development or distribution independently of provincial boundaries and beyond the functions of Local Governments to regulate. We consider that our administrative proposals will meet these requirements without trespassing on the rights and functions of provincial Governments in connection with their own local problems,

whether social, economic or industrial. In designing this central machinery, we are not in any way reducing the authority of Local Governments; for the programme of progress which we propose for them will, if conscientiously undertaken, demand a great increase of effort and of co-operation both on the part of the respective Governments and of the peoples under them. We are not taking away responsibilities from Local Governments in order to centralise them in the Government of India, but, on the contrary, are proposing additional activities for both, especially the latter, which, according to the majority of our witnesses, has been out of touch with the commercial and industrial needs of the country.

321. The duty of supervising and stimulating such important interests, many of which are vital both on economic and on military grounds, could not fairly be left to Local Governments, as the whole programme of industrial development must be framed on a national basis and, in particular, to meet military needs which will vary from year to year. Although some of these industries which are required for the direct production of lethal munitions will presumably be carried on in factories owned and administered by Government, by far the majority of them might more suitably be entrusted to private enterprise; but, if the latter are left to unassisted private enterprise, their development will be unequal, and only those will be taken up which offer the largest and quickest returns on comparatively small capital risks. Many of these industries also flourish only in family groups, and, unless the State is made responsible for the encouragement and maintenance of the economically weaker members of such groups, even the more remunerative enterprises may be neglected to the detriment and possible danger of the country. Experience of the past three years has drawn attention to the fact that the requirements of modern civil and especially industrial life largely coincide with the list of essential munitions of war, and that questions of defence are vitally connected with those of industrial development. After the war, India will find herself face to face with nations struggling to recreate their wealth and to emerge from the economic morass into which they have been plunged. All industrial problems will then assume an enormous importance for this country; and without wise guidance and the wholehearted and energetic prosecution of a strong constructive policy, India cannot possibly become strong and self-supporting, and cannot possibly fulfil her duty to herself and to the Empire.

We have proposed in this report an extensive scheme designed not only to remove the existing industrial deficiencies that threaten national safety, but to strengthen and enrich the country as a whole, by providing it with the necessary equipment for increasing its powers of production. A necessity therefore exists for a central authority organised alike for the general control of this policy, and for the actual execution of such parts of it as we have shown cannot be suitably undertaken by Local Governments. No avoidable delay can be allowed to occur in the prosecution of this policy, and care must be taken that progress must be on

even and continuous lines, and dangerous gaps avoided. These functions can only be performed by a special department of the Imperial Government.

322. The Imperial Department of Industries would control the administration of the various Acts with which it is concerned, and would be responsible for the general direction of the accepted industrial policy of the country, including technical and industrial education. The remaining duties of the department would consist of the initiation and running of any imperial pioneer and research factories that may be needed; the management of full-scale Government factories; the framing of schemes for assisting private enterprise of a class for which an imperial agency would be required; the supply of stores; the collection and dissemination of commercial and industrial information; and the direction of such scientific and technical services and departments as come under its control. The latter class of duties will involve much work of an executive nature, which cannot conveniently be performed directly by a department primarily constituted, like other departments of the Government of India, for the consideration and enunciation of matters of general policy.

Necessity for a Board of Industries.

An organisation of suitable constitution and powers will, therefore, be required for the performance of the administrative and executive duties described above. In view also of the growing complication of Government work, it is desirable to free the Member in charge from as much routine as possible, and leave him leisure to deal with questions of policy.

The executive and administrative duties of the department, many of which require special technical knowledge, should be performed in subordination to the Member by a group of responsible officers whose experience and qualifications can be best utilised by combining them in a single body. This body we propose to call the Indian Industries Board. Its constitution and functions will be outlined after enumerating the various heads of work and subordinate departments for which the Member in charge would normally be responsible. They are obviously in excess of what any one individual could effectively control, while carrying on his duties as an Executive Member of the Viceroy's Council.

323. We have, however, still to explain what, in our opinion, should be the precise relations between the Member in charge and the Board. We have considered the desirability of providing the Member with a secretariat and departmental establishment, in addition to the establishment attached to the Indian Industries Board. We recognise that the Member might with the help of a separate secretariat be able to bring a more independent judgment to bear on the Board's proposals. But the extra cost involved, and the delay and waste of work caused by the double noting, would more than outweigh the above advantages. The Member, after all, is responsible not only for laying down the general

Relations between Member in charge and the Board.

policy of the department, but for securing its energetic prosecution; and we think that this responsibility can be best maintained, not by placing him in the seat of a detached critic, but by emphasising his position as departmental head. He should, we think, be President of the Board, without the charge of any specific branch of work. This would enable him, in considering any question that may come before the Board or any proposal that may emanate from the head of a subordinate department, to take a view which would be free from the departmental prepossessions that may affect his colleagues. It will also keep the other members of the Board sufficiently in touch with the general policy of Government, to prevent inconvenient divergencies, resulting in friction or waste of work. The Member, as President of the Indian Industries Board, must have full powers as he has full responsibility, and should, therefore, be in a position to overrule the views of his colleagues; they should, however, have the right of placing their opinion on record in such cases.

Functions of Imperial Department of Industries.

324. The subjects and departments at present under the control of the Department of Commerce and Industry, which we have either specifically recommended for allotment to the proposed Department of Industries, or which should fall to its share, in view of their nature and associations, are the following:—

1. Geology and Minerals (including the Geological Survey of India and the administration of the Indian Mines Act).
2. Salt.
3. Indian Explosives Act and the Indian Petroleum Act.
4. Stationery and Printing.
5. Inventions and Designs.
6. The collection and distribution of commercial and industrial intelligence.
7. The supply of stores which, under our proposals, will include the receipt of indents and their examination and distribution for purchase in India or abroad; and the administration of the Department of Stores.
8. The Indian Factories Act.
9. The general encouragement of industries, including the grant of assistance or concessions to industrialists in cases of more than provincial importance.
10. Advice to Local Governments regarding the improvement of industries and the conduct of technical and industrial education, the latter of which duties has hitherto pertained mainly to the Department of Education.
11. The administration of the various Acts relating to steam boilers.

In respect of some of the above heads (Nos. 2, 6, 7, 9 and 10), we have proposed a considerable increase and modification in the scope of the existing work. In Chapter XV we have recommended that the

following subject be transferred from the charge of the Public Works Department to the Department of Industries :—

12. Electricity.

We think that the Department of Industries should also be made responsible for the following heads, if they are placed under the control of a civil department :—

13. Ordnance factories.

14. The inspection of ordnance manufactures.

The proposals which we have detailed in Chapters IX and XIV of our report would also involve the control by the Department of Industries of the following entirely new heads :—

15. General direction and application of chemical research, and the control of the proposed Chemical Service.

16. Imperial factories for research or demonstration.

We have proposed that chemical research and the Chemical Service should be under the Department of Industries. Of the other scientific services recommended in Chapter IX, those relating to bacteriology, botany, entomology and zoology will be so closely in touch with the work of the Agricultural and Forest Departments that they would naturally come under the same department of the Government of India. The Chemical Service would, it is true, lend its officers to practically every department of the Government of India, but its relations with industries would be so numerous that it should certainly be brought for administrative purposes under the proposed Department of Industries. The subject of geology and minerals would also have its nearest associates in the chemical group. There remain a certain number of technical industries, such as tanning and the manufacture of glass and of certain chemicals, including dyes, which would require laboratories for research, research factories and small pioneer factories on a commercial scale. The staffs of these should include chemical technologists, and, as these factories would not be permanent, the cheapest way of staffing them would be to borrow men from the Indian Chemical Service.

With reference to items 13 and 14, ordnance factories and the inspection of ordnance manufactures, we have already stated in Chapter XIV that ordinarily we see no reason for the existence of full-scale Government factories, except for the production of lethal munitions. We have taken no evidence regarding the working and control of these factories, but we have contemplated the possibility of their being placed under the Department of Industries, because their operations must be conducted on business and technical lines very similar to other activities of that department. If it be decided to hand over these factories to the control of a civil department, they would naturally be administered with direct regard to military needs (and it should not be difficult to provide an appropriate mechanism in the form of a Munitions Council to ensure this end), while they would be actually managed by specialised technical officers.

We think that the Department of Statistics should be left under the control of the Commerce Department of the Government of India, while Fisheries should not be handed over to the Department of Industries, unless that department is also eventually required to take charge of Agriculture and Forests.

325. It will be observed that the heads of business which would be placed under the Department of Industries, fall naturally into three classes, with reference to their subject matter and to the qualifications required by the supervising member of the Board. The Indian Industries Board should, therefore, consist of three ordinary members apart from the President. The member dealing with heads 1, 2, 3, 15 and 16 should be a man whose education had combined a scientific training with subsequent practical experience in subjects such as those which form the equipment of, say, a consulting mining engineer or of a technological consultant. Heads 4, 6, 7, 8, 9 and 10 are matters into which general business qualifications mostly enter. It is important that the same member should be in control of heads 6 and 7 to secure close relations between the Controller-General of Stores and the Director of Commercial and Industrial Intelligence. Finally, heads 5, 11, 12, 13 and 14 are concerned either with actual commercial production or with the business aspects of industries, and could suitably be handled by an officer possessed of business experience, though his predominant qualification should ordinarily be a knowledge of engineering.

Duties and qualifications of members of the Indian Industries Board.

We consider it desirable that, if possible, one of the members of the Board should have had actual business experience.

The equipment of the three controlling officers, whose functions we have indicated, will thus cover almost all requirements in any branch of industrial development or administration, and we have already stated that we think it desirable to combine the three officers in a Board. When an officer is dealing with a proposal of importance, even where it relates exclusively to subjects under his own control, we think that personal discussion with experienced and highly qualified colleagues, whose charge consists of allied subjects, cannot fail to be of use. Discussion by the Board will be of special value in dealing with requests for concessions and for assistance to private industrial undertakings, and with proposals for the pioneering of new industries by Government; the disposal of such matters often involves very difficult questions, but these must be systematically examined and decided, if our proposed industrial policy is to be effective.

326. The salaries of the regular members of the Board should be Rs. 4,000 a month each; their position and qualifications demand good pay, and that proposed would mark their difference in status from officers immediately subordinate to them, whose salaries would range from Rs. 2,000 to Rs. 3,000. The members of the Board should be appointed for a term of five years. To attract suitable commercial

Salaries and responsibilities of the members.

men who have proved their qualities in business, it may be necessary to offer a pension, and we consider that it would be advantageous to provide for a renewal of the period of membership in very special cases.

Each member should have power on his own responsibility to decide cases arising from the branches directly under him of less importance in point of principle or the amount of money involved; where other branches are concerned, a reference should be made to them; but in more important matters it would be desirable to invoke the collective responsibility of the Board. The members of the Board should tour regularly and frequently; and their collective functions are not likely to be exercised with sufficient frequency to interfere with this duty.

Secretary to the Board.

327. The Board would require a Secretary, who should be Secretary to the Department as well as Secretary to the Board. He should draw a salary of Rs. 3,000 a month. An Assistant Secretary would also be needed for each of the three groups of subjects that forms the portfolio of each ordinary member of the Board.

Location of the Board.

328. After careful discussion of alternative plans we feel compelled to recommend that the headquarters of the Board should be with the Government of India. We have considered the possibility of separating the Member in charge from the rest of the Board, which would have made it possible to locate the latter body at some other centre. We fully realise from the unsatisfactory experience of the past, the imperative necessity of keeping the activities of the Board in close touch with the industrial life of the country. But we think that this need will be largely met by the fact that the officers controlling the various departments under it would be working in large industrial centres, while the members themselves also would have had considerable industrial experience and would tour regularly. It would, moreover, be difficult to select an industrial centre as the headquarters of the Board, without introducing a bias that might react unfavourably on other centres. Further, the importance of maintaining close contact between the Board and the Member in charge is very great. Without it the work of the Board would be delayed and tend to become ineffective, while the Member in charge of the Imperial Department might lose touch with the concrete facts on which the industrial policy of Government must be based; misunderstandings might arise, and the Board might lose sight of the wider aspects of policy by which its proceedings should be directed.

Necessity for a Financial Adviser.

329. To ensure that the proposed department follows sound financial methods and to save the delays which necessarily arise, if references to the Finance Department are conducted by ordinary departmental routine, we recommend that the services of a Financial Adviser, with similar powers and functions to those of the Financial Adviser to the Army Department, be made available for the Industries Board, as well as for the Department of Industries. His services would be of special

value, if the Board be made responsible for the control of ordnance factories. This officer might conveniently be given a seat on the Board of Industries. This would secure for the Department of Industries a close understanding with the Department of Finance. The Financial Adviser need not be a full-time officer, but should represent the Finance Department, with powers to sanction expenditure within specified limits or to refer at his discretion proposals for expenditure to the Finance Department.

Organisation for carrying out the work of the department.

330. Our proposed organisation, both imperial and provincial, would require the services of a number of officers capable of exercising large administrative responsibilities of different kinds. It is clear, however, from the description of their duties given in the foregoing chapters, that the nature of their work would in many cases require engineering experience and in almost all practical acquaintance with business methods. The difficulty which Government will experience in obtaining such men can only, we think, be overcome by training them in an Imperial Industrial Service, and we shall now outline the manner in which this service should be organised. We propose in the first instance to discuss the working of the scheme after the initial stages, and to deal later with the difficult question how it should be started and built up. The suggested imperial department would require suitable controlling and junior officers for work under the following heads :—

The administration of the Mines Act, which is carried out by the Department of Mines.

The Department of Northern India Salt Revenue, which will, if our proposals are accepted, be concerned almost entirely with the production of salt from sources under imperial management.

Inventions and Designs, the law and regulations regarding which are administered by the Controller of Patents.

The collection and distribution of commercial and industrial intelligence obtained from provincial and imperial officers by the Director.

The supply of stores, which will require officers under the Controller-General of Stores and the provincial Directors of Industries for purchase and inspection.

The Indian Factories Act, which is administered by provincial departments consisting of Chief Inspectors and Inspectors.

The general encouragement of industries, including the grant of assistance and concessions to industrialists.

Advice to Local Governments regarding the improvement of industries and the control of technical and industrial education.

The administration of the various Acts relating to steam boilers.

This head of work would be carried-out in the same way as in the case of the Factories Act, by staffs under Local Governments.

Electricity. The Imperial Government has at present an Electrical Adviser, while the Local Governments have Electric Inspectors.

Government factories for research or administration. These woul be worked by engineers, technical specialists and chemists.

The Controller-General of Stores would fix contracts for the supply of articles, among which engineering materials would be the most important. His staff would consist of purchasers and inspectors for textile goods, timber and furniture, tools, machinery and manufactured or partially manufactured metals.

The Director of Commercial and Industrial Intelligence would collect information regarding the prices, movements and availability of raw materials and manufactured articles, new industrial processes, and the progress of industries in India.

331. Provincial Directors would have a wide range of responsibilities. They would advise and assist local industries of all kinds in technical matters and would in many cases give direct financial aid. They would control industrial and technical education. They would collect industrial and commercial information, and would be the advisers of their Local Governments in industrial and commercial matters. They would arrange for the local purchase and inspection of stores. They would have under them a staff including engineers, technological chemists, specialists in various industries, craftsmen, and technical and industrial teachers of various grades. The Deputy Directors would assist the Directors in most of these functions ; and in particular would themselves inspect institutions for technical education. They would assist the smaller private industrial concerns, and supervise the work of engineers and industrial specialists. They would also organise and administer the various forms of assistance to cottage industries. The special Intelligence Officers at Bombay and Calcutta would collect and supply commercial and industrial intelligence in these cities, especially in respect of foreign trade.

Officers of the Imperial Industrial Service employed by Local Governments would be placed under their orders as in the existing cases of the Forest and Agricultural Services.

332. A number of engineers would, as we have seen, be employed under the higher administrative officers, both imperial and provincial. Though the majority of these engineers might be engaged either on short-term agreements, or with salaries and prospects designed to retain them in Government service only for short periods, we think that some of the posts might serve as a useful training ground for higher administrative work.

A certain number of men with training in chemistry, geology, and specialised forms of engineering, such as mining (for example in the Salt Department) and electricity would also be needed.

Arguments for creating an Imperial Industrial Service.

333. A working basis for recruitment is thus indicated. It should not be difficult to select young men with a thorough training in engineering, but not yet definitely committed to any form of specialisation. If such men be recruited into a service with the duties and prospects of employment that we have described above, they would gradually acquire, in the less responsible departmental posts, business and administrative experience which would fit them for promotion to the higher grades. There would be some to whom the technique of their profession would make a stronger appeal, and these might prefer to specialise in different branches of engineering.

If, on the other hand, no such service be constituted, Government would be left with a number of isolated posts, each of which would have to be filled by separate recruitment or by casual promotion, and the result would be discontent or inefficiency on the part of the staff, and constant trouble to Government in filling vacancies. Government would find it difficult to obtain men of the qualifications required for the higher posts by direct recruitment; and would be in competition with private employers, who will themselves need just the type of men that Government is attempting to obtain. Unless, therefore, the prospects and prestige of Government service are such as to counterbalance the attractions of higher remuneration elsewhere, Government would have to be content with inferior men. The young engineer brought into Government employment may, under the scheme which we propose, reasonably count on promotion in due course to a post of Director, or of head of a department under the Industries Board; or, if his abilities are adequate, to a membership of the Indian Industries Board itself.

The parallel between these proposals and those for the scientific services is very close. In each case, we rely on the prospects of an organised service to facilitate recruitment by offering definite prospects and a continuous demand for men of a particular type, of whom a regular supply would be forthcoming in response thereto. The service would afford an elastic and convenient system of filling the various posts required throughout the country; and its existence and traditions should inspire *esprit de corps,* and give its members administrative experience and opportunities for specialisation. These qualities are expensive to buy ready-made in the open market. We do not, in the case of either the Industrial or the Scientific Services, overlook the necessity that will arise for the recruitment on special terms of men for individual appointments or lines of work, either from other Government services or from private employment, whilst outside consultants of high reputation will be needed from time to time to advise on specific problems.

It will be observed that the staff for the manufacture and inspection of munitions is not included in the above proposals. This staff will have

to serve under special regulations, to secure the preservation of secrets of military value. The ordnance factories will be a unit sufficiently large to maintain a service of their own ; but exchanges between this staff and the Imperial Industrial Service may occasionally be effected with advantage, and the latter would in any case provide a most useful reservoir for war purposes.

The Imperial Industrial Service.

334. Recruits for the Imperial Industrial Service should be men possessing qualifications such as will be obtained by mechanical engineers who have passed through the courses of training that we propose in Chapter X, or by students of the existing Indian engineering colleges who have obtained the full diploma in mechanical engineering. These qualifications are equivalent to, but not necessarily identical with, those required for admission as Associate Members of the Institute of Civil Engineers. The age of recruitment should not usually exceed 25 years. All recruits should be selected by a committee working under carefully prescribed rules. We think it desirable, if the young engineers whom we propose to recruit are to develope into valuable men, that they should be encouraged after about three years' service to take study leave, which should be given on not more than two occasions, and for not more than two subjects. The total leave so enjoyed should not exceed one year in all and should be confined to the first 20 years of service. Men within two years of their pension should not be allowed study leave. These conditions would, we think, give the best results and prevent abuses. They might also be made applicable to the scientific services.

The initial salary of men recruited under the conditions proposed above need not, on a pre-war basis, exceed Rs. 450 a month ; they should be on two years' probation ; and should be eligible on confirmation for appointment as Industrial Engineers in provincial Departments of Industries, in Government research or pioneering factories, or even, in exceptional cases, as Deputy Directors. These latter appointments, however, should as a rule be filled by men with not less than six years' experience of industrial work under Indian conditions. The pay of Industrial Engineers should be incremental, starting at Rs. 500 on confirmation and rising by stages of Rs. 50 a year to Rs. 1,500, with an efficiency bar at Rs. 1,250. More highly paid posts should in all cases be filled by selection.

The ordinary conditions governing the grant of pensions for Government service should be applicable.

Possible subsequent alteration in the nature of the work of the department.

335. We think it necessary to point out that the work which the Industrial Service would have to perform would eventually tend to change in nature. While it is impossible and useless to forecast the exact lines of alteration, the general trend, if the industrial policy which we recommend prove successful, will probably be in the direction of a lessened need for demonstration and pioneering work, and an increased necessity for research, technical education and

commercial and industrial organisation. The general characteristics of the staff employed would then become to a greater extent scientific and administrative, and to a less extent technical than at present contemplated. But the possibility of this change is relatively distant, and it is unnecessary to make proposals at this stage for any consequent change in recruitment.

Special temporary measures required.

336. To meet the situation which will exist before a regular Industrial Service has been built up, special measures will be needed. No time should be lost in introducing the proposed method of regular recruitment to fill the junior ranks of the service. But the selection of incumbents for the higher posts will be difficult, and there will be serious risks of failure and disappointment, the results of which are bound to retard progress. It is, therefore, necessary to move cautiously ; posts should not be filled merely because such posts have been created, and permanent arrangements should not be made until satisfactory candidates are available. A policy of judicious opportunism must be adopted in respect of the sources of recruitment. Suitable men may be found in one or other of the existing services or in private employment. Though we think that engineering experience must even from the outset be regarded as a desirable basis, the capacity for organisation and general business sense will be of special importance in the case of initial appointments. Some indication of the lines on which we think that selection should be exercised in the case of Directors of Industries, which will be the most difficult of all posts to fill, has already been given in Chapter XXI. For these, and for other high posts, men may have to be engaged for limited periods and on special terms.

Necessity for training Indians.

337. We have already alluded in Chapter IX to the desirability of increasing the provision for training young Indians in the higher branches of science and technology, thereby increasing in the country the number of potential recruits for the proposed scientific and technical services. We have made similar proposals for the training of young engineers of the kind required for the suggested Imperial Industrial Service. We recognise that at the outset there will be some difficulty in obtaining recruits either from England, in consequence of the demands for qualified engineers for reconstruction after the war, or from India, because of the present relatively small field of selection.

As the opportunities for technical training increase, however, we believe that the necessity for importing specialists will diminish and that ultimately these services will be mainly filled with officers trained in this country.

CHAPTER XXIII.

Estimate of Costs.

338. The proposals which we have made for the development of Indian industries involve the creation of an Imperial Department with an Industries Board exercising executive control over certain Government activities, some of which are already carried on and some of which are new; of provincial Departments of Industries, ten * in number, which will also take over certain duties from other departments, but will be mainly occupied with new work. We have prepared estimates showing the cost which the imperial and each of the provincial Governments would be called upon to bear. These estimates have been framed to provide for the work which, we think, may be done and the situation which, we think, will exist for some time after the end of the war; and we consider that the total proposed expenditure can be worked up to with advantage within a period of from five to seven years. A perusal of our report will show that we do not contemplate any extensive schemes of Government participation in actual manufacturing operations, and we provide no estimate of the cost of such Government factories as it may be found necessary to establish in the interests of national defence. Such expenditure would be incurred in pursuance of definite schemes of working prepared by expert agency, and only after their necessity has been accepted by Government.

Scope and basis of estimate.

Our proposals have in certain instances been framed only on general lines, and we have in some such cases suggested that expert committees be appointed to work out the necessary details. Moreover, the cost of experimental and demonstration work depends on the extent to which ideas likely to be useful to industrialists are evolved by the staff that we propose, and on the nature of these ideas. This can be determined only after detailed examination by that staff, based on some period of practical experience. The cost of construction and equipment of educational institutions and of industrial concerns is bound to be on a different basis under post-war conditions, and the salaries demanded by scientific and technical experts are also likely to be affected by the new economic position. Regarding all these items of cost we can be certain only of one thing, that they will be much higher than before the war, but how much this increase will be, and how it will be distributed, it is impossible to foresee at present. *We have, therefore, thought it better to*

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* *See* side headings in Statement I at the end of this chapter.

adopt pre-war rates in all cases, a method which has the advantage of giving a fairly certain basis, on which readjustments can be made as soon as the course of events makes this possible.

We have confined ourselves to (*a*) an estimate of the cost of the superior staff, establishments, and ordinary office contingencies required for the administrative organisations which we propose, (*b*) a rough estimate, based to some extent on the cost of existing institutions, of the initial and recurring expenditure on research and education, and (*c*) a general indication of the scale on which research and demonstration factories are likely to be conducted. We have not attempted to estimate the cost of office buildings for the staff of imperial or provincial Departments of Industries; in some cases accommodation is already in existence; in others buildings erected for war purposes may be made available; in others offices may be rented; local circumstances and probabilities which we have no means of ascertaining must be taken into account in each case.

Some of our recommendations involve an increase in the cadres of the Agricultural and Forest Departments. These are in most cases either in support or in modification of proposals emanating from these departments, which have been referred to us for opinion, or placed before us in evidence. We do not feel it necessary to work out the detailed estimates for these proposals; this task can be more appropriately performed by the departments in question.

The Imperial Department of Industries.

The Member in charge Rs. 90,700.

339. The charges on account of the Member would be :—

	Rs.
Salary of Member	80,000
Tour charges and travelling allowance.	10,700
TOTAL	90,700

The pay of a personal clerk, etc., would be found from the Board's establishment provision.

The Indian Industries Board, Rs. 3,96,700.

340. For the cost of the Industries Board no very useful precedent exists. The Indian Munitions Board, which is doing somewhat similar work, was started and continues under war conditions, and its functions in the purchase and control of supplies for large armies in the field naturally overshadow the rest of its work. The best basis to take is perhaps that of the Railway Board, whose work is doubtless greater

in volume than that of the Industries Board would be, though it is probably less multifarious.

	Rs.	Rs.	
3 Members (Rs. 4,000)	1,44,000		
Secretary (Rs. 3,000)	36,000		
3 Assistant Secretaries (Rs. 1,000	36,000		
Registrar (Rs. 800)	9,600		
TOTAL	2,25,600	2,25,600	
Travelling allowances and tour charges of the Board	15,000	15,000	Estimated.
Establishment—			
3 Superintendents	21,600		One-half of Railway Board.
Clerical	97,500		
TOTAL	1,19,100	1,19,100	
Allowances	16,500		Do.
Contingencies	19,500		Do.
Special charges	1,000		Estimated.
TOTAL	37,000	37,000	
GRAND TOTAL		3,96,700	

The total of Rs. 3,96,700 compares with Rs. 6,12,000 for the Railway Board in 1913-14.

As against this charge, we anticipate the possibility of savings on the cost of the Department of Commerce and Industry, which the Department of Industries should relieve of a substantial portion of its work. The expectation of savings is based on the work and establishment of the former department, before the war, and without reference to any modification of these which post-war needs may entail; we do not attempt any precise calculation in figures. The total estimate for the Department of Industries amounts to Rs. 4,87,400, or, excluding the Member, Rs. 3,96,700, against a charge of Rs. 3,46,000 for the Department of Commerce and Industry in 1913-14. No special provision is included for the supervision of ordnance factories; we consider that the members of the Board should be able to perform this duty, if necessary, without addition to their number. We also think that a separate whole-time Financial Adviser will not be necessary, and have consequently not included his salary in these estimates.

Audit and accounts, Rs. 60,000.

341. The nature and extent of the agency required for audit, apart from the ordnance factories, depends very largely on the decision reached regarding the distribution of the purchasing organisation; for the expenditure on stores would constitute by far the greatest portion of audit work. With the degree of decentralisation which may reasonably be expected in respect of stores, the cost of the necessary audit establishment should not greatly exceed that of the establishment required in the case of Delhi, which amounted in 1913-14 to Rs. 45,848. We, therefore, estimate under this head a lump sum of Rs. 60,000. The

total expenditure on the Member in charge, the Board, and on audit would thus amount to Rs. 5,47,400. The incidence of this charge which may be looked on as the cost of general supervision and control on the total expenditure for executive work performed by provincial and imperial departments, is less than five per cent.

Subordinate Departments.

342. Of the 16 heads of business which would, according to our proposals in Chapter XXII, fall under the control of the Department of Industries, there would be no additional expenditure in respect of items 3 (Indian Explosives and Petroleum Acts), 4 (Stationery and Printing), 5 (Inventions and Designs), 8 (the Factories Act), and 11 (Steam Boilers).

Geology and Minerals, no addition.

343. Under head 1 (Geology and Minerals), we have suggested the appointment of a number of officers to inspect concessions of mineral rights belonging to Government. We understand that proposals have been made for an increase in the staff of the Geological Survey Department, which provide for a number of officers sufficient, we think, to enable the department to perform this duty, at any rate for the present; we, therefore, think it unnecessary to frame any formal estimate of the cost of our proposals.

Salt, Rs. 200 saving.

344. Under head 2 (Salt), we have suggested the desirability of handing over to Local Governments the work of prevention in connection with the extraction of saltpetre in the Punjab, the United Provinces, and Bihar; and of confining the work of the imperial department to the production and distribution of salt from the sources at present under its control. This would involve the appointment of technical officers to the charge of the department itself and of the different sources of salt; but, in view of the fact that Local Governments would probably arrange for the performance of salt preventive duties by amalgamating with their excise staffs such portions of the preventive establishment as might be handed over to them, we are unable to estimate the financial effect of this part of our proposals, though it should doubtless result in a saving. Nor do we attempt any estimate of the lower establishment required for the actual extraction or production of salt, seeing that this would be increased or decreased according to the output which it is desired to obtain. For the superior supervising staff we estimate the following charges :—

	Rs.
Superintendent, Rs. 2,000	24,000
Manager at Khewra, Rs. 1,000—100—1,500 (1,333⅓)	16,000
Manager at Sambhar, Rs. 750 Manager at Pachbadra, Rs. 1,000	21,000
Manager at Kohat Manager at Warcha } Rs. 500 each	12,000
Chemist attached to the department for research and technical work, especially at Sambhar and Pachbadra, on an average pay of Rs. 1,000	12,000
Total	85,000

By relieving him of the duties of prevention, it should be possible to obtain a controlling officer, who may be styled Superintendent, on a salary of about Rs. 2,000. Under these conditions, the expert officers of the department should qualify for promotion to the post of Superintendent, which would require a general knowledge of salt extraction and administrative experience only.

Against this we have to set off the cost of the corresponding portion of the existing staff :—

	Rs.
Commissioner, Rs. 2,500	30,000
Deputy Commissioner, Rs. 1,200—40—1,400 . . .	16,000
Six Assistant Commissioners, of whom :	
One on Rs. 1,000	12,000
One on Rs. 900	10,800
and two on Rs. 500—30—800 will be replaced by the establishment above noted and the remaining two handed over with the preventive posts . . .	16,400
TOTAL .	85,200

Nett decrease . Rs. 200.

This rearrangement of functions should result in a great improvement in the methods of mining and handling salt, and in the utilisation of by-products which are at present wasted, yielding, it may be anticipated, a greatly increased revenue to Government without additional expenditure on superior establishment.

Commercial and Industrial Intelligence, Rs. 61,500 additional.

345. Under head 6 (Commercial and industrial intelligence), we propose the following increases :—

Salaries—Director of Commercial and Industrial Intelligence, Rs. 2,500, against Rs. 2,000 at present. *Note :* Rs. 2,250—2,750 (or Rs. 2,750—3,250) was proposed by the Government of India in their despatch No. 168, dated the 7th July 1916	+6,000
Establishment	+12,000
Allowances to Trade Correspondents	+12,000
Contingencies (extra)	+6,000
TOTAL .	36,000

Our recommendations for the strengthening of the Indian Trade Commissioner's office in London involve (*a*) the appointment as Indian Trade Commissioner of an officer of the rank of a provincial Director of Industries, and (*b*) the deputation of three officers seconded respectively from the Agricultural and Forest Services and the Geological Survey. The salary which a Director of Industries would draw when serving in England may be calculated at the equivalent of Rs. 2,000 per mensem, or Rs. 24,000 per annum, as against £1,350, the present pay of the Indian Trade Commissioner. An increase of Rs. 4,000 must be provided on this account. The scientific officers would have about 10 years' service

and would draw in India salaries of Rs. 1,000, Rs. 750, and Rs. 750, respectively. Under the ordinary rules, the salaries drawn in England by these officers would be approximately equivalent, at one shilling and four pence to the rupee to Rs. 666, Rs. 500, and Rs. 500, or a total charge per annum of Rs. 20,000. To these must be added a charge for books and periodicals and office expenses of Rs. 1,500, or Rs. 25,500 in all. No extra provision need be made for the Assistant to the Commissioner or for increase of establishment. The total increase under this head, therefore, amounts to Rs. 61,500.

Stores, Rs. 8,56,000.

346. The system of purchase and inspection of stores which we propose would have to be applied, both to stores at present purchased in England but to be in future purchased in India, and to stores at present purchased in India, whether under a regular system of inspection as in the case of steel rails, or without any centralised or systematised organisation for purchase and inspection, as in the case of oils, paints, and textiles.

In preparing estimates of the cost of the organisation necessary for purchase and inspection we labour under the very great disadvantage of being unable to estimate, even approximately, the volume of business which will have to be transacted. The stores bought in England in 1913-14 were valued at just below £4,000,000, and the cost of the Stores Department of the India Office was £62,000, an incidence of 1·5 per cent. on the value of the purchases. The Stores Committee of 1906, for reasons stated in paragraphs 99 and 100 of their report, considered that the true incidence was at that time actually about 2 per cent., and a somewhat similar percentage would be reached were the same principles applied to the figures for 1913-14. It is impossible to forecast the extent to which Indian stores will in the future replace those now obtained from England; but it is certain to be very substantial. The Stores Committee was of opinion (paragraph 53) that articles valued at one-seventh of the total sum spent in England could have been obtained in India in the year 1904-05. Since then the manufacturing capacity of India has greatly increased, and an extensive range of new manufactures is likely to be started after the war. On the other hand, articles such as steel rails and cement, wholly or mainly purchased in England in 1904-05 are now obtained in India.

Figures do not exist to show the total purchase in India of stores by railways and military and civil departments of Government; but the sample figures given below for local purchases by railway store-keepers and by certain military departments will give some indication of their extent.

Stores purchased in India by certain railways in 1914-15, Rs. 1,41,00,000. In this year the purchases of rails and locally manufactured iron and steel articles were necessarily very small.

Purchases of clothing, leather articles, etc., by the Army Clothing Department in the year 1913-14:—

	Rs.
Imported	11,49,000
Local	15,88,000

The above covers only a portion of the clothing requirements of the army in India.

Local expenditure on supply and maintenance of peace stores (other than food) by the Supply and Transport Corps in 1913-14, Rs. 17,53,000.

We have already indicated our opinion in Chapter XII that the precise allocation of purchasing and inspecting functions between the imperial and provincial agencies can only be made after an examination in some detail of the position in respect of each of the important classes of stores produced in India. To enable, however, an idea to be formed of the system that we propose, and of the incidence of its cost on that of the articles purchased, we have endeavoured to frame a provisional estimate of a centralised establishment which could do all that was needed, with the exception of small purchases which would be effected through the proposed provincial agency. This estimate covers the purchase of articles such as boots and textiles at present dealt with by military departments; but does not provide for the purchase of materials for ordnance factories. For the imperial Stores Department we propose the establishment detailed in Table A (para. 351). This department would receive all indents from departments directly under the Government of India and from Government railways; and would be prepared to assist other railways by arranging to include their requirements in running contracts, or by direct purchase on their behalf, if they desired it. It should also receive from the provincial Directors of Industries indents for the supply of stores which cannot be purchased locally with advantage. There should be a central office at Calcutta; and two stores depôts, for testing purposes, one in Calcutta, one in Bombay. The stores depôts would be for the receipt of miscellaneous goods which it may be necessary to examine and pass before they are issued to indenting officers; stocks should not be maintained at the depôts.

Purchasing staff (Stores). 347. The purchasing would be carried out by the following staff :—

A. One Deputy Controller, with three Assistant Controllers, dealing with the following groups :—

1. Electrical and mechanical appliances, hardware, implements and metals	One Assistant Controller.
2 Railway materials	Two Assistant Controllers.

B. One Deputy Controller, with three Assistant Controllers, dealing with :—

1. Textiles	One Assistant Controller.
2. Leather and articles of leather	One Assistant Controller.
3. Miscellaneous articles	One Assistant Controller.

C. One Deputy Controller, with one Assistant Controller, dealing with oils, paints, varnishes, and chemicals.

It should, however, be possible to effect a considerable degree of delegation to provincial departments, especially in respect of certain

types of machinery and tools, textiles, miscellaneous articles, oils, and paints. The work of the above staff would consist mainly of fixing contracts; casual purchases could probably be best effected in most cases by the provincial Directors. In addition a Supervisor of Stores Contracts, who should unite business and legal experience, would be required, to ensure contracts being drawn in due form and containing the proper provisions needed to secure the interests of Governments.

Inspecting staff (Stores).

348. The senior inspecting officers should each possess expert knowledge regarding a particular class of materials. In all we anticipate that 6 inspectors and 20 assistants will be required. This staff should be under a separate Deputy Controller (inspection), to ensure their independence of the purchasing branch.

Table A gives details as to the superior staff and clerical and subordinate establishment which, we think, it would be necessary to employ. It will be seen that the total estimated cost of the department amounts to Rs. 8,56,000.

The Testing House at Alipore.

349. Associated with this Stores Department would be the present Government Testing House at Alipore. It would necessarily require extension, both as regards personnel and laboratory accommodation. Fees are now charged for tests, and, if this system be continued, the Testing House and its establishment should be self-supporting.

Possibilities of decentralisation.

350. We assume that the Controller-General, in addition to his general supervising functions, would be responsible for the transmission to the India Office of all indents which cannot be complied with in India. We have provided for the equipment of the imperial Stores Department with a full staff of experts; but it will be for the Committee whose appointment we have proposed to say to what extent the work of this department should be decentralised. As suggested in Chapter XII, the Controller-General of Stores should arrange for the centralised purchase of certain articles, such as the products of Indian iron and cement works, which require inspection by highly qualified experts; he might also make running contracts for the supply of classes of goods which are required on a large scale, such as certain kinds of textiles and oils, and the local Directors of Industries would make their purchases under these contracts. By this means, competition between provincial Governments would be avoided, and manufacturers would be placed in a more favourable position for dealing with Government orders. The provincial Departments of Industries would be equipped with a purchasing and inspecting staff capable of dealing with a fair proportion of the local engineering and miscellaneous manufactures.

The provincial Stores Departments would have to deal with indents the value of which would be roughly proportional to the provincial revenues. The work of provincial Stores Departments would not be confined to the purchase of stores required locally. Excepting stores

purchased by the Controller-General, all supplies required by provinces should be purchased by the stores agency of the province in which they are produced. The volume of business handled by these departments would, therefore, depend to some extent on the manufacturing capacity of the province.

Incidence of cost.

351. Our present estimate involves an annual cost of eight and a half lakhs of rupees and we think that purchases are not likely to fall short of 4½ crores, and may considerably exceed that figure. The resulting incidence is thus less than two per cent. and, though decentralisation, if efficiency is to be maintained, is bound to add to the cost of purchase, some increase is possible without raising the incidence to an unduly high figure.

Table A.

			Monthly. Rs.	Yearly. Rs.
		Controller-General (Rs. 2,750—3,000)	2,916$\frac{2}{3}$	
Purchase	Engineering .	Deputy Controller . .	1,750	
Purchase	Textiles .	Ditto	1,500	
Purchase	Chemical Industries	Ditto	1,500	
	Inspection .	Ditto	1,500	
Purchase	Railway Materials (2); Textiles . .; Chemicals and Oils; Machinery .; Leather . . .; Miscellaneous . .	7 Assistant Controllers, Rs. 800—1,200 . . . (Average 1,000).	7,000	
	Inspection .	6 Inspectors, Rs. 800—1,200 (Average Rs. 1,000) . .	6,000	
		20 Assistant Inspectors, Rs. 450—700 (Average Rs. 600) . . .	12,000	
		Supervisor of Stores Contracts . . .	1,500	
		Total .	35,666$\frac{2}{3}$	
		Travelling allowance .	7,250	
			42,916$\frac{2}{3}$	
			(*Say* 43,000)	5,16,000
		Establishment .		2,50,000
		Office rent, contingencies, and depôt expenses . . .		90,000
		Total .		8,56,000

Industrial Education, Rs. 99,200.

352. Under heads 9 and 10 (Encouragement of industries, advice to Local Governments, and industrial and technical education), the only expenditure incurred by the imperial department would be in respect

of the staff of visiting experts, who would work directly under the appropriate member of the Industries Board. The allotment of work among these should be effected by one of them, who might be styled Senior Visitor. A small office staff, principally of tour clerks, would be required. The inspectors would be mainly concerned with industrial schools; the inspection on behalf of the imperial department of the higher institutions would be largely performed by members of the Industries Board and other high technical officers.

	Rs.	Rs.
Salaries.		
6 Visitors, Rs. 1,000 average	72,000	72,000
Establishment.		
Clerks (including tour clerks)	10,000	
Servants	1,200	11,200
Allowances	12,000	12,000
Contingencies	4,000	4,000
TOTAL .		99,20C

Imperial assistance to industrialists, which falls under head 9, would take the form of guarantees, loans, subscription of capital, special concessions of raw materials at low prices, or transport at favourable rates. It is impossible to form any idea of the probable amount likely to be chargeable under these heads. A large proportion of the outgoings should be recouped when the aided concerns are in full working.

Electricity : Hydrographic Surveys, Rs. 3,00,000.

353. Under head 12 (Electricity), the charges on account of the Electrical Adviser to Government would remain unaltered; but allowance should be made for the cost of hydrographic surveys.

The object of these surveys should be to determine definitely where sites exist for the generation of water power, either continuously throughout the year or with only a short period of intermission during the hot weather. It is not intended that each scheme should be worked out in detail; but merely that sufficient information should be gathered to enable a definite statement to be made as to the general possibilities of a site. The survey should be placed under a Public Works officer of the rank of Chief Engineer with a wide experience, which should include the construction of storage works and the administration of irrigation schemes. It would be necessary to associate with him an electrical adviser, and it is for consideration whether the Electrical Adviser to the Government of India could not perform this office. A certain amount of information of a not very definite character has already been collected by the Public Works Department; and this, we think, should be carefully scrutinised with a view to selecting areas and sites for the initial investigations. It is impossible to say what the result of these preliminary scrutinies will be; but it may be taken as certain that ten or a dozen proposals would be worth a personal visit on the part of the Chief Engineer and would possibly justify the formation of survey

parties for further investigation. It is also desirable at an early date to enquire into the potentialities of power supply from the great irrigation canals of Northern India and the Periyar project in Madras. We may assume that it would be worth while to begin with surveys at ten or a dozen different places, and that as many survey parties would be needed. It is not possible to furnish any very accurate estimate of the cost of the work; but we assume that under the Chief Engineer two senior Executive Engineers would be required, and as many Assistant Engineers as there are parties established. We may take the cost of the Chief Engineer and his office establishment at Rs. 60,000 a year, the cost of the two senior Executive Engineers and their establishment at Rs. 40,000 a year, and the cost of each survey party at Rs. 15,000 a year, or Rs. 1,50,000 for ten parties. A lump sum provision of Rs. 50,000 is also necessary for the establishment of gauging stations to measure the flow of water in streams, and rain gauges to determine the amount of rainfall in the catchment basins, which will be mainly in places distant from established meteorological stations. It is probable that sufficient work would be found to keep this establishment for a period of about five years, making the total cost of this preliminary hydrographic survey about 15 lakhs of rupees.

Ordnance factories and inspection of ordnance manufactures

354. We do not frame any estimates under heads 13 (Ordnance factories) and 14 (Inspection of ordnance manufactures).

Chemical research, Rs. 5,00,000.

355. Head 15 relates to chemical research, and includes the Indian Chemical Service. The cost of a portion of this service has been taken against the various heads in which these officers will be employed. The scheme, however, must be at present regarded merely as a general proposal, until it has been examined by the committee which we have proposed in paragraph 123 of Chapter IX, and we have, therefore, not framed estimates to cover the whole of the scheme, though for the sake of convenience we indicate the probable cost of the nucleus administrative staff and laboratory. The increased cost in salaries for the service generally has been roughly foreshadowed in our report as about nine lakhs of rupees.

We estimate the cost of the nucleus establishment on the following basis. We may assume that the superior staff detailed below can be advantageously employed :—

	Rs.
Chief Chemist, Rs. 3,000	36,000
8 Chemists (of whom two will probably be physical chemists) on average pay of Rs. 1,000	96,000

Allowance must also be made for the cost of salaried research students and of men brought in from time to time for special work from the Chemical Service. The recurring cost of the Pusa Institute, with nine specialists and with an expensive farming estate to keep up, is approximately Rs. 5,12,000; that at Bangalore, with five specialists, is about

Rs. 2,60,000. A total annual allotment of Rs. 5,00,000 should cover the recurring cost of the imperial laboratory and nucleus staff, with all incidental charges.

Our proposals also contemplate the appointment of three Deputy Chief Chemists, who would be located at different centres of specialised chemical research, one or more of which might be existing research institutes, as may be determined later. The cost of these officers is not, however, provided in this estimate, as this and other details of our scheme are dependent on the conclusions of the proposed committee.

Imperial factories for research and demonstration, Rs. 1,00,000.

356. In paragraph 364 of this chapter we make provision for experiments and research which will include the running of pioneer and demonstration factories under provincial Departments of Industries, such as, possibly, silk filatures and sugar or *gur* plants. The great bulk of the work under this head would be of provincial interest, but there would also be a few cases in which the results would be of much wider value and the expenditure and difficulties involved often proportionately greater, and these, we think, should be undertaken under the control and at the cost of the imperial department. As instances of experimental factories which could be more appropriately started by imperial agency may be cited (*a*) glass works, on account of the wide range of experts needed, and (*b*) wood distillation, which would yield results of very general application, and should be applied to a number of different species of trees. It would be for the Industries Board to decide on the best site for the factory in each case and to determine the exact object of the experiment, which should be placed in charge of a suitable specialist. In some cases it would be possible, when the original scheme had been approved by the Board, to place such a factory under the general supervision of the local Director of Industries, but in others, especially where the raw products dealt with are the property of a department like the Forest Department, it would be necessary to retain it under imperial control, which would be exercised by a member of the Board. Apart from initial capital outlay, which can only be estimated when the individual scheme is worked out, and would generally be recoverable before the experiment is concluded, we think that the average nett annual cost should not be more than Rs. one lakh, though the budget provision for expenditure would of course far exceed this figure. We anticipate that the products manufactured would usually more than cover the running expenses, exclusive of the special staff and establishment which the experimental nature of the work would involve.

Provincial Departments of Industries.

Heads of expenditure.

357. The expenditure of provincial departments would fall mainly under the following heads :—

(1) Administration and control.

(2) Education.
(3) Experiments and demonstrations.
(4) Professional advice and assistance to local industries.
(5) Grants of loans, and supervision and inspection of rural industries.
(6) The inspection of factories and steam boilers.
(7) Collection of intelligence.
(8) Purchase of stores.

Under most of these heads, the previous experience available as a guide in framing our estimates is somewhat scanty. We may, however, now proceed to examine such as there is, and to draw therefrom such conclusions as seem practical.

Administration and control, Rs. 13,66,200.

358. The administration of provincial Departments of Industries should be in the hands of officers of the Imperial Industrial Service, and in each province there should be a Director of Industries, assisted in the larger provinces by a Deputy Director. The services of industrial engineers will also be required, who would conveniently be employed in territorial charges. In these charges they would carry out many of the duties which we have assigned to Deputy Directors generally, besides advising and assisting owners of industrial plant, and administering the distribution of loans. In addition, staff may be required, as we have already indicated, for the purchase and inspection of stores. In Bengal and Bombay there should also be two special Commercial Intelligence Officers of the rank of Deputy Directors. Chemists who would be members of the Indian Chemical Service would also be required for one or two provinces which will not have technological institutes at the outset. The salaries which these officers should draw in each province would usually be those which they would receive as members of the services to which they belong, and the probable average figures are exhibited in Statement I at the end of the chapter, from which it will be seen that the total annual cost amounts to Rs. 13,66,200. We have also proposed that the staff employed for the administration of the Electricity, Factories, and Boilers Acts should be transferred to the Departments of Industries, and only in the case of the Electric Inspectors, for reasons given in Chapter XV, do we propose any additional expenditure. For these latter, we consider that a pay of Rs. 1,000 or Rs. 1,200 would be sufficient in the provinces where electrical installations are fewer in number. For the Electric Inspectors of Bengal and Bihar and Orissa, we propose salaries of Rs. 1,500 in view of the growing developments in the coal fields; while the special importance which electricity is assuming in Bombay will, we consider, necessitate a salary of Rs. 2,000 to secure an officer of first-rate abilities. The cost of the necessary subordinate establishment has been calculated for one or two provinces, and approximates to two-thirds of the pay of the officers employed. This basis has been adopted throughout, but we have thought it advisable to distinguish between the technical subordinate establishment, which would include the staff of the headquarters' laboratories and workshops.

and the clerical and administrative staff. The superior staff of the larger provinces would, as we have said, include industrial engineers who would be assigned territorial charges; but, ultimately, as the subordinate territorial agency of circle officers becomes more efficient, we anticipate that some degree of specialisation will be found desirable: and it may, for instance, prove convenient, while retaining at headquarters a single officer as Deputy Director who would assist the Director and would deal particularly with economic and business questions and commercial intelligence, to hand over the work in connection with organised industries to a second officer who would be pre-eminently a mechanical engineer; and to entrust the administration of loans to a third officer with engineering knowledge, who would have acquired special experience in dealing with rural and cottage industries.

Technical and industrial education Rs. 1,42,00,000 capital expenditure, Rs. 62,00,000 recurring (of which Rs. 35,00,000 will be new), *vide* paragraph 375.

359. The statistical returns furnished to the Educational Commissioner show that in 1916-17 the total expenditure in India on technical and industrial education was Rs. 27,17,913, made up as follows:—

TABLE B.

———	* Expenditure.	Number of students.	Cost per student.
	Rs.		Rs.
Engineering Colleges	8,26,731	1,319	626
Schools of Art	2,81,391	1,695	166
Engineering and Surveying Schools . .	3,02,694	874	346
Technical and Industrial Schools. . .	13,07,097	10,037	130
TOTAL .	27,17,913		

* NOTE.—To simplify the figures, the small expenditure on female education, almost entirely in industrial schools, is omitted from consideration throughout.

The average cost per student in Table B requires a more detailed analysis before any deductions can be drawn therefrom. This we now proceed to furnish in Table C, which gives details regarding the four engineering colleges under Government management.

TABLE C.

———	Cost.	Number of students.	Cost per student.
	Rs.		Rs.
Madras	1,45,296	511	284
Poona	1,12,792	220	512
Sibpur	2,33,795	284	528
Roorkee	3,34,848	304	1,101
TOTAL	8,26,731		

From Table C it will be seen that the cost per student varies from Rs. 284 at Madras to Rs. 1,101 at Roorkee. The explanation for this great difference is that in Madras the students are non-resident and most of them are studying for subordinate grades, whilst at Roorkee the students are resident and a much larger percentage of them have in view the higher branches of the services.

So far as is practicable, we have examined the budgets of the technical or technological institutions which already exist, few of which, however, provide as high a class of training as we contemplate should be given in the future. As a typical example, we might cite the Agricultural College at Coimbatore, the budget allotments for which, in 1918-19, amount to Rs. 1,27,553. This college provides for the training of from 100 to 120 resident students. Besides teaching work, the staff also carries on a considerable amount of research, and manages an experimental and demonstration farm which yields produce worth Rs. 25,000 per annum. The nett cost per student is, therefore, under Rs. 1,000 per annum. An examination which we have made of the cost of an engineering and technological institute on the lines which we propose has led to somewhat similar results. In our estimates for technical and technological training we have assumed that the average cost of training would be about Rs. 1,000 per student per annum. This, we think, is an inclusive figure.

We have drawn attention to the urgent necessity for the training of mechanical engineers; and we are indebted to the East Indian Railway Company for a detailed estimate (see Appendix N) for a school of engineering at Jamalpur, on the lines we have proposed. The establishment of this school would involve a capital outlay of Rs. 2,75,000 and recurring charges of Rs. 1,50,000, and is intended to provide accommodation for 160 students. This estimate of capital expenditure allows for existing hostel accommodation for 90 apprentices, costing Rs. 90,000; and this amount should be added to arrive at the total cost of establishing a school on the lines worked out by the engineering authorities of the East Indian Railway. The conditions at Jamalpur are somewhat exceptional, as the proportion of European apprentices is unusually large. We have prepared an estimate for an engineering school associated with a large engineering establishment, in which all the apprentices would be Indians, and we find that the capital outlay required on a basis of 200 apprentices works out at about Rs. 2,000 per head, and the average cost per annum at Rs. 570 per head. Considering that more than half the training of the apprentices is given in the workshops, the cost is very high; but this is due to the fact that we consider it necessary at the present time to offer special inducements to attract a sufficient number of educated Indians as apprentices. These inducements take the form of free board and lodging in addition to the wages which they will earn; but we anticipate that, as the prospects which will be open to this class of student become better appreciated, the necessity for free board and lodging will gradually disappear; and that in the meantime public bodies and individuals will offer scholarships to provide for students in

excess of the number estimated. The artisan apprentices would also receive elementary technical instruction in the engineering school which we propose, but we do not consider that this will involve extra expenditure on buildings, equipment, or staff.

360. In regard to the capital cost of new colleges and institutes, we have not been able to obtain figures on which a reliable estimate can be based. The College of Engineering in Madras is in course of transfer to a new building; the sanctioned estimates amount to Rs. 17,75,000, and, allowing for the value of the plant and apparatus transferred from the existing college, we may assume that the capital value of the new college will be Rs. 20,00,000. It will provide accommodation for 500 residential students. The majority of these, however, belong to the upper subordinate and subordinate classes, and it is fair to assume that the accommodation provided for the staff and the equipment of the laboratories and workshops would have to be on a somewhat larger scale if all the students belonged to the advanced classes. Students of technology would, however, be of various grades, and, while the capital outlay for the highest grade would certainly be not less than Rs. 6,000 per head, the average for all classes would probably not exceed Rs. 4,000.

We have been furnished by the Director of the Indian Institute of Science with a very detailed analysis of the capital expenditure incurred on that institution. The total amounts to Rs. 23,50,000. At the very outside it is capable of providing accommodation for 100 research or advanced students. The expenditure in this case has been on a lavish scale and, making allowance for this, the capital outlay per research student need not have exceeded Rs. 20,000. Beside the educational returns on this expenditure in the shape of trained research workers, the commercial value of the research results must also be considered, for it exceeds the total capital outlay on this institute.

361. It now becomes necessary to frame some estimate of the number of students for whom higher education in engineering and technology should be provided. The Department of Statistics has furnished us with a return of the number of large industrial establishments in India, and of the number of persons employed in them. The number of establishments is 4,053 and of persons employed 1,135,147. The figures relate to the year 1915 and do not include any returns from the mines. We have not been able to make use of these figures, and we present them merely to afford some indication of the scale of manufacturing operations at the outbreak of war. But, with these figures before us, we think it will not be deemed excessive to provide for an annual outturn of 400 trained technologists and 400 mechanical engineers, capable ultimately either of becoming foremen, or of occupying positions superior to those of foremen. Taking the average length of the courses for technological students as three years, there would be 1,200 under training at any one time. The capital outlay involved would be about Rs. 50 lakhs, out of which, after assessing the valuation of existing facilities, Rs. 40 lakhs may be taken as new expenditure, and the annual expenditure would be

Rs. 12 lakhs, to which must be added about Rs. 7 lakhs* for the training of the civil engineering students. The course for mechanical engineers will usually not be less than five years, which involves a provision for 2,000 apprentices at a cost of Rs. 40 lakhs initial charges and Rs. 11,40,000 recurring.

The cost of improving the existing system of mining education, as estimated by the Macpherson Committee, was as under :—

	Rs.
School of Mines—	
Initial	5,56,000
Recurring	98,000
Evening classes—	
Initial	1,51,000
Recurring	71,000

We accept these figures for the purposes of this estimate.

362. We may now proceed to consider the cost of training students of a lower grade. The returns of the Educational Commissioner for 1916-17 throw some light on this ; but as the work has been done hitherto in a very unsatisfactory way, it is evident that a much larger expenditure will have to be incurred in future than in the past.

TABLE D.

——	Government.	Local Fund and Municipalities.	Private aided.	Private unaided.
Schools of Art . . .	5	...	1	3
Engineering and Surveying Schools.	9	...	7	3
Technical and Industrial Schools.	38	41	85	17

Table D furnishes details regarding the number of schools of art, of engineering and surveying schools, and of technical and industrial schools at present in the country. Some are managed by Government, some by local funds and municipalities, and some by private agency, and the last-named are divided into those which receive grants-in-aid and those which do not. The unaided schools may be omitted from consideration, as the usual reason for their non-receipt of Government aid is that they are not classified as eligible. The five Government Schools of Art train 1,310 pupils at a cost of Rs. 2,61,314, which works out almost exactly to Rs. 200 per head The Government technical and industrial schools, which are really all industrial schools, are 38 in number and train 2,431 students at an average cost of Rs. 160 per head. Those under private

* Out of Rs. 8,26,731 shown in Table C about Rs. 7 lakhs may be taken as the expenditure exclusively on civil engineering.

management aided by Government are 85 in number and train over 4,000 students at an average total cost of Rs. 177 per head. These are mainly mission schools.

These average figures are not of much value as they relate to institutions of very different merit. In all these schools some part of the receipts is derived from the sale-proceeds of work done in the school by the pupils, and in the better-managed schools this is an important source of income. Taking this into account, we think that industrial schools can be run at an average cost per pupil of Rs. 200 per annum, and that they can be established with a capital outlay of Rs. 500 per student. Ordinarily, schools should not train more than 100 pupils at a time. The average attendance at present is very much less than this, but only a few of these institutions are under competent superintendents with a trained staff of teachers. Our estimates provide for the ultimate establishment of 150 such schools, affording accommodation for 15,000 pupils and involving a capital outlay of Rs. 75,00,000 and annual recurring charges of Rs. 30,00,000. The whole of this expenditure should not fall upon provincial revenues, although it figures in Statement II as a provincial charge. As these are institutions which would be entirely devoted to the improvement of cottage industries, and would be almost entirely of local interest, the bulk of them, therefore, should be controlled and supported by local bodies or by private agencies, and be assisted by Government only through grants-in-aid. For purposes of administration the schools would be grouped territorially under the Deputy Directors, who would doubtless avail themselves of the services of the expert head masters of the higher-grade Government schools in matters connected with the detailed working of the smaller schools.

363. It would also, however, be necessary to appoint thoroughly qualified visiting experts for industrial schools, and these have been included in the cadre of the imperial department. The majority of industrial schools can be grouped as metal-working, textile, and wood-working schools, a division which would require three experts for each province as inspectors; but it is fairly certain that no one province would be able to find full-time employment for so many men. The inspection of these schools, and the control of those which are either directly under Government or under local bodies, should, we think, be provided as follows. The Government schools should, as we have already proposed in paragraph 143, be under the charge of one or more skilled industrial teachers, who would be primarily responsible for their efficiency. The advantages of sharing in this arrangement would be also open to industrial schools under local bodies. This would save expense in the first instance, and admit of some reduction on the estimate we have framed. Later, as funds were available and skilled teaching staff was trained, each school might be self-contained. The ultimate responsibility for these schools would naturally lie with the Director of Industries, who would regularly inspect them with the help of his superior staff. We have, however, pointed out the divergencies of method, and the general inefficiency of these schools, and have drawn attention to the necessity of

securing a better appreciation of the most promising methods of working. We are, therefore, of opinion that the inspection work should be done by imperial officers who should, in all cases, however, report to the Local Government responsible for the schools inspected. It is highly important, in the matter of inspection, that the charges of the officers responsible for this work should be allotted by subjects, rather than on a merely territorial basis. They should be able to advise in regard to the instructional courses, the manufacturing processes, and the commercial disposal of the goods manufactured. Cottage industries are of enormous importance in India, and, if they are not only to hold their own, but to make real progress, they must be assisted by the best experts obtainable. We doubt whether an officer can effectively inspect more than 25 schools scattered through India, and, on the assumption that ultimately there will be 150 industrial schools, about six visiting experts would be required (see para. 352).

Experiments and demonstrations, Rs. 6,50,000.

364. In the aggregate a great deal of money has been spent in the past upon experiments and demonstrations; but little or no information is available regarding the conditions under which these were carried on, and this expenditure consequently affords no useful basis for future estimates. In the Memorandum on the Department of Industries in the Madras Presidency, Appendix J, we find that the experimental manufacture of aluminium ware was carried on for six years and resulted in a nett profit of Rs. 30,000; while chrome-leather experiments extended over seven years and cost in all Rs. 55,000. Similarly, in regard to weaving, Rs. 85,000 was the nett expenditure in 15 years. These figures show that a great deal of work can be done for comparatively little money; but, on the other hand, pumping and boring operations in 11 years have cost Rs. 6,80,000, and the budget estimates for 1917-18 provide for an expenditure of Rs. 1,48,000. Against this charge, a sum of Rs. 35,000 in receipts from fees is estimated. We find in the budget of the Madras Department of Industries for 1917-18 a provision of Rs. 1,18,000 is made for industrial experiments, and that, in the Agricultural Department's budget, the sugarcane breeding station at Coimbatore is estimated to cost Rs. 42,000 a year. Excluding such experiments and demonstrations as may properly fall within the purview of the imperial department, we have come to the conclusion that under this head the following provisions should be made for the provincial departments :—

	Rs.
Madras Bombay Bengal United Provinces	1,00,000 each.
Burma Punjab Central Provinces Bihar and Orissa	50,000 each.
Assam North-West Frontier Province	25,000 each.

These sums do not include the salaries of the officers who would control such work, which would be borne on the provincial establishments.

Professional advice and assistance to local industries.

365. The work of giving advice and assistance to local industries will form part of the duties of the Director of Industries and his staff and should involve no expenditure beyond that provided under the head of "Administration and control"; in fact, under this head, there should be a gradually increasing income, as only in backward tracts should such work be undertaken without fees. We have seen that such fees are already levied in the Madras Presidency, and we gather that they have not proved deterrent to industrial progress, while they prevent much waste of time in dealing with futile applications. The Madras rules, as sanctioned in Government Order No. 856, dated August 10th, 1916, will illustrate the lines on which it has been found possible to work such a system.

Grant of loans and the supervision and inspection of rural industries, Rs. 12,72,000.

366. In Chapter XX we recommend the grant of advances and hire-purchase loans on the lines that have been experimentally followed in Madras and Mysore, and we estimate that, when the provincial Departments of Industries are fully equipped, advances to the extent of about a crore of rupees a year might be taken with good results. The whole of this money would be spent on the equipment of cottage industries and the establishment of comparatively small factories, or of power plant mainly engaged either in lifting water for irrigation or in the preparation of local raw produce, largely agricultural. The administration of these loans would necessitate the examination of the security tendered by the applicants, and the consideration of their capacity to carry on the work that they propose to take up. In almost every case it would also involve a very careful scrutiny of the conditions affecting the success of the enterprise. Where loans are granted, it will almost inevitably follow that plans and estimates will have to be prepared, the machinery purchased and erected, the staff to work it trained and, finally, the plant handed over in good working order. To perform these duties we have proposed, under the head "Administration and control," the appointment of Deputy Directors with experience in mechanical engineering, and they should be assisted by a sufficient subordinate engineering establishment, most of which would be organised in territorial charges. We think that at first the enquiries into titles and encumbrances of landed property might be conducted by the local revenue staff; later on, if the work increases largely, special arrangements may prove necessary. For a major province making advances which would average about 10 lakhs of rupees a year, and be recoverable within a period of six years, the maximum outstandings would amount to 60 lakhs of rupees which, at 6¼ per cent. interest, would yield a revenue of Rs. 3,75,000. As the rate for *takavi* loans was fixed when the conditions under which the Government of India could borrow money were very different from those now existing, it would be necessary to consider whether the interest chargeable should not be raised to a

figure which would render this important branch of the work more or less self-supporting. In some at least of the major provinces we anticipate that employment may be found within five years for about 15 circle officers in each, who with their establishments would cost on an average Rs. 1,000 a month each. Roughly, it may be assumed that at least one-third of their work would be connected with the disbursing of loans and the carrying out of hire-purchase agreements; and, on this assumption, and taking the cost of supervision and establishment into account, there would be chargeable against the loans account in such a province, as the cost of administration, about Rs. 80,000 a year. If, for example, money can be borrowed at 5½ per cent. interest, the charges would amount to Rs. 3,30,000, and the cost of administration to Rs. 80,000, making a total of Rs. 4,10,000, which would be covered by a rate of interest on the loans of 7 per cent. It would not press unduly on borrowers if 7½ per cent. were charged to allow a margin for contingencies. This should not prove at all a heavy burden, as experience has shown that the economic results of such loans, when properly expended, are very striking, and not a few instances have occurred in which the whole capital outlay has been recouped within one or two years. It should be the policy of the Departments of Industries to make the work of supervision and inspection as far as possible self-supporting. Efforts should be also made to encourage the establishment of rural engineering factories capable of taking over the work which, in the first instance, would have to be done under the supervision of circle officers; the facilities which we have proposed for training mechanical engineers would help to render this possible.

Inspection of factories and steam boilers.

367. From the Budget Estimates of 1917-18 the following tabular statement has been prepared showing the expenditure on the inspection of factories and steam boilers.

—	Factories.	Boilers.
	Rs.	Rs.
Bombay	69,000	92,000
Bengal	62,000	...
Madras	32,200	32,100
Burma	17,300	...
United Provinces	16,700	25,200
The Punjab	13,600	14,900
Central Provinces	...	25,600
Bihar and Orissa	700	...
Assam	...	...
Total	2,11,500	1,89,800

We have no additions or alterations to suggest under these heads.

Collection of commercial and industrial intelligence, Rs. 36,000.

368. The collection of commercial and industrial intelligence would be effected by the various members of the departmental staff in the course of their ordinary work. The territorial organisation of the staff would no doubt render this easier. A compiling and recording agency would be required, which is included in our estimate of the Director's office charges. In the case of Bombay and Calcutta, we have recommended the appointment of special provincial officers for commercial and industrial intelligence; their salaries, in consideration of the work which the commercial importance of these cities would entail, should be Rs. 1,500 a month.

Purchase of stores.

369. The share of the cost shown in the present estimate under the head, Stores (Imperial), which would ultimately be made over to provincial departments, would depend on the decision reached as a result of the special enquiry which we have already suggested.

Capital Expenditure.

(a) *Recommended Schemes.*

Under the head of capital expenditure it is possible to furnish only a rough estimate based upon the figures which we have obtained regarding the cost of buildings and equipment of existing institutions, and upon the immediate needs of the provinces, so far as we can estimate these.

Industrial schools, Rs. 55,00,000.

370. We have already stated that we think provision should be made for training 15,000 pupils, and that the average cost of the industrial schools and their equipment will be Rs. 500 per pupil. This involves a total expenditure of Rs. 75 lakhs, from which must be deducted the value of such existing institutions as may prove suitable. From Table D it will be seen that there are at the present time 181 schools owned as follows:—

Owner.	No.	No. of pupils.
Government	38	2,431
Local Funds and Municipalities	41	2,998
Private bodies receiving grants-in-aid	85	4,092
Private bodies not receiving grants-in-aid . . .	17	516
TOTAL .	181	10,037

Some of these may disappear, others may be greatly modified, and new schools may be started. It would not be safe to reckon that more

than Rs. 20 lakhs can be taken as the value of buildings that would be of use under our proposed scheme ; and the nett cost would be, therefore, Rs. 55 lakhs.

Technological institutes, Rs. 47,00,000.

371. The following tabular statement shows the amounts which we think should be provided for each province for technological institutes :—

	Rs. Lakhs.
Burma	8
Bihar and Orissa	13
United Provinces	6
Bengal	10
Madras	5
Bombay	5

At present, beyond the school of engineering at Insein, no provision has been made for technical education in Burma. A technological institute is needed in or near Rangoon which should at the outset provide accommodation for about 100 students. The capital outlay per head would be considerably above the average rates shown in paragraph 360, in view of the high cost of materials in Burma and of the fact that the institute would be at first on a limited scale. We have, therefore, proposed a total expenditure of Rs. eight lakhs.

Technological institutes would be required for Bihar and Orissa and for the United Provinces, which might be at Bankipore and Cawnpore, respectively ; for each of these an initial outlay of Rs. six lakhs should be sufficient. The former province would also require a school of mines at Dhanbaid and improved accommodation for evening classes on the coal fields costing in all Rs. 7,07,000, or (say) seven lakhs of rupees.

Bengal has at present only the Sibpur College of Engineering ; chemical technology is inadequately provided for, and about Rs. four lakhs could usefully be spent on developments for this purpose. A technical institute might be required at Dacca on a similar scale to those we have proposed for Bankipore and Cawnpore. This would make the total expenditure on capital account in Bengal Rs. ten lakhs.

The College of Engineering, Madras, at a cost of Rs. five lakhs, can be expanded into a technological institute, to which the Leather Trade School should be attached.

In the Bombay Presidency there is already the Victoria Jubilee Technical Institute and the Poona College of Engineering ; these can be usefully developed, the former with special reference to chemical, and the latter to electrical, technology, at an estimated cost of Rs. 2½ lakhs each.

Total for India	Rs. 47,00,000

372. In connection with railway workshops or large engineering establishments, we propose the establishment of ten schools, each capable of dealing with about 200 apprentices. These schools would be located alongside suitable existing workshops, which would result in the following distribution :—one each in Madras, United Provinces, Punjab, Bihar and Orissa, Burma, and Assam, and two each in Bengal and Bombay. We estimate that each school will cost about Rs. four lakhs, made up as follows :—

Training of mechanical engineers, Rs. 40,00,000.

	Rs.
Hostels for 200 apprentices	2,00,000
School buildings	75,000
Models, furniture, and equipment	25,000
Houses for staff	1,00,000
TOTAL	4,00,000

No provision has been made for the cost of the site, as land can usually be provided free of cost.

For ten schools the capital charge will be Rs. 40 lakhs.

373. We gathered from the experience acquired in Madras that a technically qualified Director of Industries would find it extremely convenient, for the purposes of test and experiment, and for the expeditious transaction of current work, to have a small mechanical workshop and laboratory for both chemical and physical tests. Provision for the upkeep of this has been made under the heading of establishment, and the cost of materials and experiments would be met from the provision for experiments and demonstrations. These workshops and laboratories may be estimated to cost eventually from Rs. 50,000 to Rs. 1,00,000 but would only gradually be built up as work developes and industrial progress is made. A total provision of Rs. eight lakhs, which would be spread over about five years, is deemed sufficient for this item.

Workshops and laboratories attached to Directors' Offices, Rs. 8,00,000.

(b) *Possible Schemes.*

Rs. 66,00,000.

374. The remaining proposals involving capital expenditure are :—

(1) The Metallurgical Research Institute at Sakchi.

(2) The Central Chemical Research Institute.

(3) The Imperial Engineering College.

In regard to the first two of these, however, we have only suggested their examination by expert committees; while we do not contemplate the early establishment of either the second or the third. It is, therefore, perhaps needless at this stage to do more than indicate roughly our own opinion of the scale on which we think they should be undertaken. In putting forward the figures given below we have carefully scrutinised the expenditure incurred in recent years on the highest-grade teaching and research institutes which have been started.

The Central Chemical Research Institute should be on a slightly, larger scale than the Indian Institute of Science at Bangalore, and may, therefore, be estimated to cost Rs. 20 lakhs. The Imperial Engineering College should, we think, provide ultimately for about 500 students which, at the rate we have already given, *viz.*, Rs. 6,000 per head, would cost Rs. 30 lakhs. The Metallurgical Institute at Sakchi would probably provide a four years' course for 50 metallurgical students. Owing to the expensive character of the equipment required for metallurgical experiments, and the relatively small number of students to be provided for compared with the other technological institutes we have proposed, the capital cost may be taken at Rs. 8,000 per head, or Rs. 16 lakhs in all

Summary of Estimates.

375. Statements II and III, appended to this Chapter, show in a tabular form the annual charges on account of the imperial and the provincial Departments of Industries, which amount to Rs. 24,63,900 and Rs. 98,98,500, respectively, or Rs. 1,23,62,400 in all. Only new expenditure has been included in the figures for the imperial department; but, in the case of the provincial estimates, it is necessary to set off against the proposed expenditure the existing charges, which cannot be exactly determined, but are approximately Rs. 38,00,000, including Rs. 27,00,000, shown in Table B. as the existing cost of industrial and technical education, Rs. four lakhs for Factories and Boiler Inspection (para. 367), and Rs. seven lakhs on Industrial Departments. A further deduction should be made on account of local contributions, to which reference is made in para. 362, but it is impossible to estimate the precise share which local bodies may be willing to take in the provision of industrial education. Omitting this latter, the total additional recurring charges, therefore, would be in the neighbourhood of Rs. 86 lakhs.

In Statement IV the estimated capital expenditure under various heads is shown. It amounts to Rs. 150 lakhs, with a further possible expenditure of Rs. 66 lakhs. We consider that an annual grant of Rs. 30 lakhs for about seven years will meet the demands which are likely to be made, if the schemes which we have recommended are carried out.

STATEMENT I.

Average salaries of administrative and controlling staff of provincial Departments of Industries.

—	Director.	Deputy Director.	Industrial Engineer I.	Industrial Engineer II.	Electric Inspector.	Commercial Intelligence Officer.	TOTAL.	Establishment.	Total monthly charges.	Annual expenditure.	Travelling allowance.	TOTAL.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Bengal . . .	3,000	1,500	1,250	1,000 / 1,000	1,500	1,500	10,750	7,500	18,250	2,19,000	15,000	2,34,000
Bombay . . .	3,000	1,500	1,250	1,000	2,000	1,500	10,250	7,000	17,250	2,07,000	15,000	2,22,000
Madras . . .	3,000	1,500	1,250	1,000	1,200	...	7,950	5,300	13,250	1,59,000	12,000	1,71,000
United Provinces .	2,500	1,500	1,250	1,000	1,200	...	7,450	5,000	12,450	1,49,400	12,000	1,61,400
Bihar and Orissa .	2,500	...	1,000	750	1,500	...	5,750	3,750	9,500	1,14,000	10,000	1,24,000
Burma . . .	2,500	...	1,000	750	1,200	...	5,450	3,650	9,100	1,09,200	12,000	1,21,200
Punjab . . .	2,500	...	1,000	750	1,200	...	5,450	3,600	9,050	1,08,600	10,000	1,18,600
Central Provinces .	2,500	...	1,000	750	1,000	...	5,250	3,500	8,750	1,05,000	10,000	1,15,000
Assam . . .	2,000	...	1,000	...	...	...	3,000	2,000	5,000	60,000	6,000	66,000
North-West Frontier Province.	1,500	...	...	...	...	...	1,500	1,000	2,500	30,000	3,000	33,000
												13,66,200

STATEMENT II.

Detailed statement of provincial recurring expenditure.

—	Bombay.	Bengal.	United Provinces.	Madras.	Bihar and Orissa.	Burma.	Punjab.	Central Provinces.	Assam.	North-West Frontier Province.	TOTAL.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Industrial Education	4,00,000	4,00,000	5,00,000	5,00,000	3,00,000	2,00,000	3,00,000	3,00,000	60,000	40,000	30,00,000
Technological Education	4,00,000	4,00,000	5,00,000	2,50,000	3,19,000	2,00,000	...	...	...	...	20,69,000
Training Mechanical Engineers.	2,28,000	2,28,000	1,14,000	1,14,000	1,14,000	1,14,000	1,14,000	...	1,14,000	...	11,40,000
Experiments and Demonstrations.	1,00,000	1,00,000	1,00,000	1,00,000	50,000	50,000	50,000	50,000	25,000	25,000	6,50,000
Circle Officers and Establishment.	1,80,000	1,80,000	1,80,000	1,80,000	1,20,000	1,20,000	1,20,000	96,000	72,000	24,000	12,72,000
Factories and Boilers	1,61,000	62,000	41,900	64,300	700	17,300	28,500	25,600	...	...	4,01,300
Administration	2,22,000	2,34,000	1,61,400	1,71,000	1,24,000	1,21,200	1,18,600	1,15,000	66,000	33,000	13,66,200
TOTAL	16,91,000	16,04,000	15,97,300	13,79,300	10,27,700	8,22,500	7,31,100	5,86,600	3,37,000	1,22,000	98,98,500

STATEMENT III.

SUMMARY OF IMPERIAL AND PROVINCIAL RECURRING EXPENDITURE.

Imperial Expenditure.

	Rs.	
Department of Industries	5,47,400	
Commercial Intelligence	36,000	
Indian Trade Commissioner	25,500	
Stores	8,56,000	
Visiting Experts for Industrial Education	99,200	
Hydrographic Survey	3,00,000	
Central Chemical Laboratory	5,00,000	
Research and Demonstration Factories	1,00,000	
	24,64,100	
Less savings on Salt	200	
TOTAL	24,63,900	24,63,900

Provincial Expenditure.

	Rs.	
Bombay	16,91,000	
Bengal	16,04,000	
United Provinces	15,97,300	
Madras	13,79,300	
Bihar and Orissa	10,27,700	
Burma	8,22,500	
Punjab	7,31,600	
Central Provinces	5,86,600	
Assam	3,37,000	
North-West Frontier Province	1,22,000	
TOTAL	98,98,500	98,98,500
GRAND TOTAL		1,23,62,400

STATEMENT IV.

ESTIMATE OF CAPITAL EXPENDITURE.

(a) Recommended Schemes.

	Rs.
Industrial Schools	55,00,000
Technological Institutes	47,00,000
Machanical Engineering Schools	40,00,000
Workshops and Laboratories attached to Director's Offices	8,00,000
	1,50,00,000

(b) Possible Schemes.

	Rs.
Matallurgical Institute	16,00,000
Imperial Engineering College	30,00,000
Central Chemical Institute	20,00,000
	66,00,000

CHAPTER XXIV.

Summary of Recommendations.

Chapter I.—Rural India, past and present. Chapter II.—Some Industrial Centres and Districts.

(1) The first two chapters are introductory and descriptive, the case of Burma being specially dealt with.

Chapter III.—Raw Materials for Industries.

Vide Appendices B and C.

(2) Indian industries must be largely based on agricultural products and the Agricultural Services require strengthening to undertake the necessary research work. Attention is specially directed to the problems presented by cotton cultivation, by sugar cultivation and manufacture, and the necessity for scientific work on oil seeds is brought to notice.

Vide Appendix D.

(3) The trade in hides and skins and the tanning industry are of great importance. The solution of the existing problems lies in stimulating the production of leather and of lightly-tanned hides and skins. The possession of an abundance and great variety of natural tan-stuffs lends special importance to this industry in India.

Vide Chapters IV, XXII. Appendices E, F.

(4) The mineral resources of India offer opportunities for important developments.

(5) The forest estates of Government yield inadequate returns, and an expert service of forest engineers is required to facilitate extraction. Provision for the training of forest engineers should be made in India.

(6) Special measures are required to bring timbers of the less-known species to the notice of consumers. Government depôts under the charge of officers selected for their commercial aptitude should be established for this purpose.

(7) The staff and equipment of the Forest Research Institute at Dehra Dun are insufficient, and additions to the staff are necessary.

(8) The Departments of Industries should co-operate with the Forest Department to create the necessary link between the research officers and possible consumers of special timbers.

(9) Plantations should be established to secure a concentrated and, therefore cheap supply of suitable wood for special industries and for fuel.

(10) Indian fisheries (especially deep-sea fisheries) have been neglected, except in the case of Madras, and their possibilities should be developed by properly equipped Fisheries Departments. Scientific ichthyologists should be added to the Zoological Survey. The creation of Fisheries Departments in Burma and Bombay, and a substantial addition to the staff of the Bengal Fisheries Department are suggested.

Chapter IV.—Industrial Deficiencies of India.

(11) The industrial deficiencies described show the national necessity of establishing certain "key" industries. Where secret or very highly specialised processes of manufacture are involved, Government should take steps to facilitate their introduction.

Chapter V.—Industries and Agriculture.

(12) There are many ways in which the employment of power or hand-driven machinery can assist the agriculturist, particularly in respect of irrigation, sugar production and oil milling.

(13) The demand for machinery for these processes would lead to the establishment of agricultural engineering works.

Vide Recommendation (132).

(14) Close co-operation between the Departments of Industries and Agriculture is needed.

(15) The Director of Industries in each province should have a workshop and laboratory equipped for the mechanical testing of small prime-movers and of the machinery that they are intended to drive.

(16) The possibility of irrigation in Sind by means of pumps should be considered in connection with the Indus barrage scheme, in order to estimate the commercial practicability of growing Egyptian cotton on a large scale.

Chapter VI.—Power.

Vide also paragraph 28.

(17) A special survey of the coal situation in India should be undertaken at an early date, with a view to introducing economies in the methods of mining and consumption. Such a review of the fuel situation in eastern India should include an examination of the measures in progress for rendering more accessible the undeveloped fields of Assam.

(18) There are great advantages in using wood fuel after conversion into gas rather than directly, and, in particular, in employing charcoal for the production of gas after the removal of the by-products which are of value for industrial purposes. Any methods which are likely to cheapen the cost of fuel for gas plants should be the subject of detailed investigation and trial.

(19) Possible sources of industrial alcohol should be investigated. A liberal policy should be followed by the excise authorities when commercial requirements conflict with excise regulations.

(20) The utilisation of water power is of the highest importance in view of the necessity of creating electro-chemical and thermo-electric industries and of economising the use of coal. An organisation should at once be created by Government to carry out a systematic survey of the hydro-electric possibilities. Standard conditions for hydro-electric licenses should be prescribed.

(21) Leases of water power to private persons should provide for the resumption or transfer of rights and for the acquisition of the hydro-electric plant on an equitable basis, should it become necessary in the public interest, or should the initial industrial undertaking be compelled at any time to cease working.

(22) Proposals for generating water power from canal falls and other irrigation works should be considered by a joint committee composed of officers of the Public Works and Irrigation Departments.

Chapter VII.—The Indian in Industries. Chapter VIII.—Government Industrial Policy in recent years.

(23) These chapters are wholly descriptive.

Chapter IX.—The Organisation of Scientific and Technical Services and the Provision for Research Work in India and Abroad.

(24) In future all scientific officers should be recruited into imperial services, but placed under Local Governments or departments of the Government of India for administrative control. Their purely scientific work should be subject to the criticism and advice of the head of their service, transmitted through their administrative superiors. An imperial Indian Chemical Service is most urgently required.

(25) A special committee should be appointed, including a distinguished chemist from abroad, to formulate proposals for the permanent organisation and terms of service of the staff, and for the location and equipment of research laboratories.

(26) In the case of other scientific subjects, such as botany, bacteriology, zoology and entomology (which last should be recognised as a distinct administrative unit), imperial services should similarly be organised; and suitable committees might be appointed to work out details.

(27) Conditions are suggested to govern the relations between Government research officers and private industrialists who may desire to employ them on specific problems.

(28) Recruits for the scientific services should be drawn as far as possible from the Indian Universities and institutes. At first it will be necessary to import a number of specialists from England, but the ultimate object should be to man the services with officers trained in this country.

(29) The most promising bases for the establishment of specialised institutes of research will be at the chief centres of industries; but expert opinion is necessary to fix the location of these institutes. This subject should be included in the scope of enquiry of the committees recommended to work out the organisation of the scientific services.

(30) There are serious drawbacks to research work connected with Indian problems being undertaken abroad, and there is no longer any justification for the expenditure of Indian revenues on the maintenance of the Scientific and Technical Department of the Imperial Institute. In the rare cases which necessitate reference to British or foreign specialists, scientific officers in the Indian services should be empowered to communicate, through a recognised channel, with the Scientific and Technical Research Department recently established in England.

Chapter X.—Industrial and Technical Education.

(31) The existing system of State technical scholarships for study abroad, though greatly improved by the revised Government rules recently issued, should not be utilised to enable students to acquire training in industries new to India. These scholarships should be granted only to men with some experience in existing industries, to enable them to acquire further specialised knowledge, and should not be awarded in respect of subjects for which adequate educational facilities are available in the country.

(32) Suitable primary education for the artisan and labouring population is urgently necessary. When private employers undertake the task of providing it, they should be assisted by Local Governments.

(33) Industrial schools should be controlled by the Departments of Industries. Their head masters must possess practical skill in the industries taught and knowledge of their economic conditions. These schools are a means of suitable training for cottage, but not for organised, industries.

Vide also Recommendation (47).

(34) Organised industries may be divided into two classes, manipulative, such as mechanical engineering, and non-manipulative or operative, such as the manufacture of chemicals. Training for manipulative industries should be given in the works themselves, to which theoretical classes should be attached. There are certain cases where the individual concerns are not large enough for this; these can sometimes be conveniently dealt with by central teaching institutions serving a group of works; but where such an arrangement is impossible, and in the case of the textile trade where the preliminary training can best be given in a school, instruction may be more conveniently provided in technical schools with workshops or instructional factories attached.

(35) In the case of non-manipulative industries the necessary training can usually be given in a teaching institution; but practical experience is needed if the student is to rise in his profession. In these

industries, the instruction should be mainly technological, *e.g.*, in a branch of applied chemistry, with some training in engineering, and can be given in a teaching institution. The necessary practical experience must be gained in the factory, in which the student's technological training will qualify him at once for employment.

(36) The training required for mechanical engineering, as an example of a manipulative industry, is discussed in detail.

(37) At the large engineering shops practical training should be given to artisan apprentices on an organised system, with teaching in shop hours; and the apprentices should be paid wages, a part of which they might receive in the form of deferred pay on leaving.

(38) In the case of foreman a system of apprenticeship on conditions that should attract middle-class Indian youths is suggested, with teaching in shop hours of a more advanced type than in the case of artisan apprentices, and providing for boys who would start at a somewhat higher age.

(39) In the case of mechanical engineers also, the large engineering shops should be used as the practical training ground; but a greater proportion of the time should be devoted to theoretical teaching of a higher kind than is necessary for foremen. Those students who desire it may, after completing their shop training, take courses in special subjects at an engineering college.

(40) The engineering colleges should, as soon as is practicable, make over the training of subordinates to lower-grade institutions, and should add departments for technological training. These colleges should be administered by Councils, on which the University, the Departments of Industries, and employers should be represented, while the Council should have the privilege of electing a certain number of its members to represent it on the University Senate. The Universities would decide which of the college courses should qualify students to sit for a degree.

(41) In addition to the existing provincial institutions, two imperial colleges seem likely to be needed ultimately, one for the highest-grade teaching of engineering and the other for metallurgy and mineral technology.

(42) Government should encourage the foundation in India of scientific and technical societies on the lines of the London institutions.

(43) It is recommended that the engineering classes in the Victoria Jubilee Technical Institute, Bombay, should be adapted to meet the requirements of the apprentices in the railway and other workshops in Bombay, and that the courses in technology should be supplemented by two years' practical work before the full diploma can be gained.

(44) As regards mining, the evening classes on the coal fields should be retained and improved; and the scheme put forward for a school of mines at Dhanbaid is preferable to the present arrangements at Sibpur

and should be adopted. Meanwhile, the existing course at Sibpur should be improved.

(45) The technical school at Sakchi for metallurgical training proposed by the Bihar and Orissa Government is approved, but without prejudice to the possibility of a higher-grade institution.

(46) In respect of commercial education it is of the utmost importance to secure the co-operation of commercial men. Commercial colleges should be administered by Councils consisting largely of business men with representatives of the Universities; these Councils should also elect from among their members delegates to the University Senates. The Universities should retain the right to prescribe which courses of the colleges shall qualify a student to sit for a University degree.

(47) All industrial and technical institutions of less than collegiate rank should be controlled by the Department of Industries, though the advice and co-operation of the Department of Education is desirable.

Vide also Recommendation (33).

(48) To prevent inefficient or misdirected teaching, inspection and advice by officers of the imperial Department of Industries would for some time be of great assistance to provincial departments.

Chapter XI.—Commercial and Industrial Intelligence.

(49) Commercial and industrial statistics should not be commented on except by an agency which has expert knowledge of their significance. The Director of Statistics should be a compiling officer only.

(50) The Director of Commercial and Industrial Intelligence, whose headquarters should be in Calcutta, should be supplied with information by provincial Directors and by the special provincial intelligence officers proposed for Calcutta and Bombay. The help of commercial associations should be utilised so far as possible.

(51) He should advise the Government of India regarding commercial questions, especially those relating to overseas trade. He should also answer enquiries from the public, but should refer those relating to technical matters to the appropriate expert department.

(52) Crop forecasts should be prepared by the Agricultural Department, as soon as its staff is sufficiently strong to undertake the task.

(53) More complete information regarding industrial employment and production is required.

(54) The Indian Trade Commissioner in London should be assisted by temporarily seconded members of the Agricultural, Forest and Geological Survey Departments.

(55) Government should consider the desirability of establishing Indian trade agencies after the war in other countries, such as East Africa and Mesopotamia.

(56) The Indian Trade Journal should be replaced by periodical bulletins. More use should be made of the press for disseminating current industrial and commercial information.

Chapter XII.—Government Purchase of Stores.

(57) The creation of an organisation for the purchase and inspection of stores in India is recommended working under the Imperial Department of Industries and the local Departments of Industries in each province.

(58) The appointment of a small expert committee is proposed to consider the precise allocation of spheres of action between the imperial and provincial agencies.

(59) All indents for Government and railway stores should be met, as far as is practicable, in India. Indents from provincial officers should be dealt with first by the provincial Directors, who should fill them to the utmost possible extent from local manufactures.

(60) The remaining items should be forwarded to the Controller-General of Stores with the Government of India, who would issue orders for those items which could be advantageously obtained in India and would purchase the residue through the Stores Department of the India Office. Indents from Government railways and from such other railways as desire to participate in the scheme should be dealt with by the Controller-General of Stores, in the same way. The stocks would not be held by the Stores Department.

(61) Provincial Departments of Industries should, so far as their equipment permits, inspect the goods supplied through them. They should include, in the larger provinces, an experienced officer who would be responsible for local purchases. Interchange of information with one andther and with the Controller-General of Industries would make it possible for provincial Directors to purchase stores from other provinces direct.

(62) For some time to come inspection work should be performed mainly by an imperial inspecting staff, which would also collect information regarding the manufacturing possibilities of the country.

(63) The purchase of stores in India would be facilitated by the existence of an agency in India for preparing specifications in certain cases.

(64) The Controller-General of Stores should have his headquarters at Calcutta and should work in close contact with the Director of Commercial and Industrial Intelligence. His annual report should include, for the information of manufacturers in India, a classified statement of the articles obtained by him here and from abroad.

Chapter XIII.—Land Acquisition in relation to Industries.

(65) Provision should be made, where necessary, in local laws to enable persons, who are prevented by legal restrictions from transfer-

ring their lands or from conferring an absolute title therein, to do so with the sanction of some proper authority, when the land is required for an industrial enterprise, more particularly for the housing of industrial labour.

(66) Government seems to have been uncertain in the past as to the applicability of the Act to land required by industrial concerns; and a criterion is proposed by which the Local Government may determine the cases in which compulsory acquisition under section 40 (*i*) (*b*) of the Land Acquisition Act may be effected on behalf of an industrial concern. These suggestions apparently do not involve any amendment of the Act, though, if they do, this should be undertaken.

(67) In certain cases, on the recommendation of local bodies, Government should compulsorily acquire land to provide fresh sites for industries, which it is necessary to remove on grounds of public health, and for industrial dwellings.

Vide also Chapter XVI.

(68) In all cases where land is acquired compulsorily for industrial enterprises, cultivators or house owners so dispossessed should be offered suitable land in exchange or part exchange.

Chapter XIV.—Technical Assistance to Industries by Government.

(69) Direct technical assistance by Government is necessary to encourage certain classes of industries.

(70) The functions and limitations of pioneering and demonstration factories are described.

(71) For cottage industries, peripatetic demonstrations of improved processes and machinery are most important, and the provision of new patterns and designs must be arranged for. The organisation of production by the establishment of small auxiliary factories and the employment of labour-saving devices are very desirable.

Vide also Chapter XVII.
Chapter XVIII.

(72) For organised industries, in addition to assistance in starting new industrial undertakings, useful work can be done by Government in helping the owners and managers of small power plants to maintain them in good working condition.

(73) While ordinarily Government should itself carry on industrial operations only for the manufacture of lethal munitions, it will be necessary in some cases to control and assist private factories capable of producing military necessities. Assistance will also be required for industries of national economic importance.

(74) The above duties cannot be performed without properly equipped Departments of Industries, both imperial and provincial. While the utmost possible decentralisation is desirable, there are certain functions for which the Imperial Government must be responsible.

Chapter XV.—Miscellaneous Points of Government Law and Practice affecting Industries.

The Employment of Jail Labour.

(75) Power-driven machinery should not be allowed in jails. Provincial Directors of Industries and their Boards should be authorised to make recommendations to the Local Government on the employment of jail labour.

The Prevention of Adulteration.

(76) The legislation now being undertaken by provincial Governments for the prevention of the adulteration of foodstuffs and drugs is approved. The agency for enforcing the existing Acts should be considerably strengthened.

(77) Regarding the adulteration of raw produce for export or local manufacture, action should be left to the trade itself. Government should do what it can to strengthen the hands of local mercantile bodies who are interested in such matters.

(78) A system of Government certificates of quality is impracticable and unnecessary, except in the case of fertilisers, for which an Act similar to the Fertilisers and Feeding Stuffs Act of 1906 (Great Britain) should be introduced.

The Administration of the Boiler and Prime-Mover Acts.

(79) The principles laid down by the Public Services Commission in dealing with the Boiler Inspection Department are endorsed. The following recommendations are added:—

(a) Boiler inspection should be a duty of the provincial Departments of Industries.

(b) The rules for determining permissible pressures for boilers should apply to the whole of India.

(c) The laws compelling persons in charge of boilers to possess certificates should be abolished.

The Mining Rules.

(80) The favourable consideration of Government is asked for the proposed strengthening of the Geological Survey, which should include a suitable staff to inspect Government concessions and to advise small mine owners.

(81) Such inspection would ensure the due fulfilment of the conditions of prospecting licenses and permit of their being framed on more elastic lines. Local Governments should have power to extend their duration up to 5 years in cases where the work of proving the existence of minerals necessitates operations on a very extensive scale.

(82) The present mining lease form might be considerably shortened and simplified by including some of its provisions in local rules.

(83) Certain provinces should prepare Mining Manuals similar to those published in the Central Provinces and Burma.

The Administration of the Electricity Act.

(84) The status of Electric Inspectors should be improved in order to secure more highly qualified men.

(85) To ensure intelligent liberality in the interpretation of the rules, the appointment of provincial Advisory Boards, as contemplated in section 35 of the Act, is proposed. These Boards should be permitted, when necessary, to consult experts such as the Electrical Adviser to the Government of India.

(86) Government should encourage the industrial use of electricity supplied from central generating stations. The law should, if necessary, be amended, so as to permit of the load factor being taken into account in fixing the charges.

(87) The Electric Inspectors should be transferred from the control of the Public Works Department to that of the Department of Industries.

Patents, Trade Marks, and Business Names.

(88) No change is needed in the existing patent law, which seems well suited to Indian conditions, nor is it desirable at present for India to join the International Convention, but the position may have to be reconsidered if patent law is consolidated throughout the Empire.

(89) The registration of trade marks or business names is not recommended.

Registration of Partnerships.

(90) With a view to legislation to secure the compulsory registration of partnerships, Government should consider a suggestion that members of a joint Hindu family should be regarded as a single unit for the purposes of registration.

Chapter XVI.—The Welfare of Factory Labour.

(91) The inefficiency of Indian labour can be remedied by the provision of education, the amelioration of housing conditions, the improvement of public health, and a general policy of betterment.

Vide **Recommendation (32).**

(92) Compulsory education should be introduced for all classes of children in areas where this is feasible; the question of amending the Factories Act may then be considered, if necessary.

Vide **Recommendation (67).**

(93) As regards housing it has already been recommended that Government should use its power to acquire land on behalf of employers for the housing of labour, subject to certain safeguards.

(94) Land might also be acquired at the cost of Government or of the local authorities concerned, which they might lease at easy rates to employers for erecting industrial dwellings.

(95) Local authorities should be responsible for the development and lay-out of industrial areas on suitable lines, and for securing the maintenance of proper sanitary conditions in such areas.

(96) It would be undesirable and unjust to compel individual employers to house their own labour.

Special proposals for Bombay.

(97) The question of congestion in Bombay must, however, be taken up at once. The scheme for industrial housing prepared by the Improvement Trust might be continued along with the measures which are proposed below to meet the special difficulties existing in Bombay.

(98) To avoid congestion in future no industrial concerns should be started, except in the north-east of the island of Bombay or in south-east of Salsette, without the consent of the Municipality. In the area set aside for industrial development, the requisite powers should be taken by the local authorities to determine whether certain classes of industries should be admitted to certain sites, and the necessary steps should be taken to ensure the development of the settlement on sanitary lines.

(99) To relieve existing congestion, the railways should be induced to locate their new workshops at a reasonable distance from the city and to furnish accommodation for their labour *in situ*. Government departments and public bodies should provide housing of a suitable type for their workmen, where possible in the northern industrial area.

(100) The establishment of improved means of communication, including the electrification of suburban railways, and the extension of the tramway system, with the object of creating an industrial suburb, is required.

(101) In the case of employés of industries located in the city, a definite standard of accommodation for industrial dwellings should be determined, and a programme of construction worked out and taken up at the expense of the local authorities who should then manage the buildings. If the existing resources of these bodies, together with such assistance as the Local Government may be able to spare, are not sufficient, further taxation should be imposed, mainly on employers.

Proposals of general application.

(102) The possibility of reducing the present maximum factory hours, whether by a shift system or otherwise, requires further examination, as the shortening of working hours may have an important influence in raising the standard of comfort, when the workers have learned to employ their leisure hours more profitably.

Vide **Appendix L.**

(103) The policy proposed by the Sanitary Commissioner will improve the public health and the efficiency of labour.

(104) The responsibility for general welfare work among factory labourers must devolve mainly on private individuals and associations.

Government and local bodies, as well as employers, should, however, assist them as far as possible.

Chapter XVII.—Cottage Industries.

(105) The ordinary census provides an unsatisfactory means for the collection of useful occupational statistics, and special enquiries or surveys are needed.

Vide Appendix I.

(106) The establishment of central silk-reeling and twisting factories is desirable.

Vide Appendix G.

(107) The introduction of better tools and plant and of a more minute subdivision of processes should be encouraged by Departments of Industries.

(108) In the case of weaving, provision should be made in the weaving schools for the instruction of a small number of pupils of a higher class, with better educational attainments and prospects of being able to start for themselves in business. They should be given practice in the control of workmen, and should receive a training in the commercial as well as in the technical side of their profession, either in private undertakings run with Government assistance as demonstration factories, or in commercial sections attached to the industrial schools.

(109) Directors of Industries should be empowered to grant small loans to cottage workers and to supply tools and plant on the hire-purchase system.

(110) Provincial art officers should maintain a close connection with the craftsmen and supply them with new ideas and designs. Periodic exhibitions should be held, advertisements issued, and attempts made to introduce the art productions of the country to outside markets.

(111) Emphasis is laid upon the necessity for improving the methods of marketing the products of cottage industries. The Departments of Industries must create or stimulate the creation of sale agencies in India and, where possible, abroad.

Vide Recommendation (114).

Chapter XVIII.—Co-operation for Small and Cottage Industries.

(112) The way to industrial co-operation must be paved by familiarising workers with the principles of co-operative credit.

(113) Certain co-operative functions, such as the joint use of machinery, can be better achieved by bodies created *ad hoc*, than by superimposing them as an additional object on existing primary societies.

(114) The difficulty of industrial co-operation lies largely in the absence of expert but disinterested non-official business helpers. This may be remedied, either (*a*) by the introduction of the small entrepreneur, which, however, might not prove advantageous to the worker in the long run, or (*b*) by the establishment of sale organisations managed

either by Government or by private persons. Government should be prepared to risk some loss on experiments in this direction.

Vide Recommendation (129).

(115) Direct assistance in the form of loans should be given by Government to agricultural or industrial societies for the purchase and employment for the common advantage of comparatively costly machinery and plant. The Director of Industries should initiate industrial societies and should give them advice in technical and commercial matters after they are started; but he should not interfere with the administration of the Act and rules.

Vide Recommendation (132).

(116) The Departments of Industries, Agriculture and Co-operation must work closely together.

Chapter XIX.—Industries and Transport.

(117) Internal traffic, especially in the cases of raw materials conveyed to, or manufactured materials conveyed from, manufacturing centres should be rated as nearly as possible on an equality with traffic of the same class and over similar distances to and from the ports.

(118) Rates on traffic to ports should be fixed on the principle of what the export traffic can stand over its whole journey to the port of foreign destination.

(119) The same principle should apply to imports, but the lowest possible rates should be allowed for machinery and stores imported for industrial use in India.

(120) The whole distance travelled by a consignment, and not the distance travelled over individual lines, should be taken as the basis, when tapering rates apply. The way in which these rates, as well as 'block' rates and 'terminal charges,' have been applied in the past, has tended to operate against Indian industries. The total freight charge for a consignment passing over several lines should be calculated as a single sum, which should be shared between the different railways, allowance being made, where necessary, for any extra cost incurred by a particular line.

(121) The addition of a commercial member to the Railway Board is suggested.

(122) Indian industries and commerce should be represented by officers of the Department of Industries and also by members of recognised commercial bodies at the Railway Conference and at the meetings of the Goods Classification Committee.

(123) Special rate concessions for a term of years might be given to new industries, when investigation by the Department of Industries shows this to be necessary.

(124) Government should take up the question of improving the existing waterways and should give early consideration to the prospective advantages of a Waterways Trust in Calcutta.

(125) The Department of Commerce should take steps to secure harmonious working between railway and waterway administrations (including coastwise traffic) for the development of those parts of the country which are served by both.

Chapter XX.—Industrial Finance.

(126) In order to meet the difficulties experienced by small and middle-class industrialists in obtaining financial facilities and generally to provide a more elastic system of industrial finance, industrial banks are needed. An expert committee should be appointed to consider what additional banking facilities are necessary, whether for the initial or for the current finance of industries; what form of Government assistance or control will be required to ensure their extension on sound lines as widely as possible throughout the country; and whether they should be of provincial or of imperial scope, or whether both these forms might not be combined in a group of institutions working together.

(127) A scheme is explained for the provision of current finance for middle-class industrialists, by which the banks would lend money subject to a guarantee by Government after an examination by the Director of Industries and his expert staff of the financial standing of the applicant and the prospects of his business. This scheme deserves attention, at any rate as an interim measure until industrial banking facilities are more general.

(128) In a few cases Government should provide direct financial aid. Such assistance might take the form of guarantees of dividends, loans of money, undertakings to purchase output, or contributions to share capital. All these forms of aid should be subject to suitable precautions. Government directors, when appointed, should not act so as to delay decisions. Where industrial undertakings receive Government aid, their capital should be raised in India, under conditions which will give opportunities to small investors and encourage Indians to participate in industrial ventures. Assistance of this kind to 'national safety' undertakings should be a matter for the Imperial Government; in other cases, it may be given by Local Governments, if they possess the necessary expert staff to estimate the prospects of the proposed undertaking.

(129) Assistance should also be given to small and cottage industries by the local Departments of Industries in the shape of small Government loans or by financing the purchase of plant on the hire-purchase system. Fresh legislation would be required to ensure a ready means of recovery of the money so advanced.

Chapter XXI.—Provincial Departments of Industries.

(130) The creation of specialised Departments of Industries is necessary to co-ordinate the various forms of provincial activity which have been suggested, and to perform certain functions at present entrusted to other non-specialised agencies.

(131) The establishment is required in each province of a Department of Industries under a Director, who should act as Secretary to Government for commercial and industrial subjects.

(132) To ensure that the Departments of Industries, Agriculture and Co-operative Credit work in close harmony, they should be under the control of the same Member of the provincial Executive Council.

(133) The Director of Industries should be assisted by a Board whose members should be appointed by Government, in some cases on its own selection, in others on nomination by suitable public bodies. Where the Board and the Director disagree, the matter should be referred to superior authority. The Board should consist of not less than 6 or more than 12 persons, who should be mainly non-official. The members of the Board and of sub-committees formed for special purposes might be offered fees and travelling allowances.

(134) The Board should have power to co-opt members for temporary or special purposes and to appoint standing or temporary sub-committees.

(135) The Department of Industries should consist, in addition to the Director, of a Deputy Director (in the larger provinces), industrial engineers, chemists, industrial specialists and teachers, and certain other officers. Initially, these officers may be recruited as circumstances best allow; but as the Imperial Industrial and Scientific Services are established, the provincial department should obtain its superior officers from these services. They should be entirely under the orders of the Local Government. Specialists in various lines of applied technology who are engaged in teaching would also serve as advisers to Government and to private industrialists. Subordinate officers with a knowledge of mechanical engineering will be required in territorial charges to help small industries.

Chapter XXII.—An Imperial Department of Industries.

(136) The direction and co-ordination of the general industrial policy of the country and the proper performance of certain functions of high national importance can only be effected through an Imperial Department of Industries, in charge of a Member of the Viceroy's Executive Council; and there is a sufficient number of closely correlated functions to justify the creation of a specialised imperial department for their performance.

(137) Special arrangements are, however, required to secure the prompt and efficient performance of the administrative and executive

duties which will fall to the lot of the imperial department; and also to free the Member in charge from routine work, and to leave him leisure to deal with questions of policy. For this purpose we propose the creation of a Board to be called the Indian Industries Board, consisting of three members with separate charges. The member in charge of the Department should be President of the Board without any special portfolio, but with full power to overrule his colleagues, who, however, should have the right to place on record their opinions. The Members of the Board should ordinarily hold office for five years only. There should also be a Secretary to the Board and the Department, as well as three Assistant Secretaries to the Board.

(138) The various subjects and departments which the Department of Industries would control, including those to be transferred to it from other existing departments of the Government of India, fall into the following natural groups :—

Group I.—

Geology and Minerals.

Salt.

Explosives and Petroleum.

The Chemical Service and chemical research.

Government factories for research or demonstration.

Group II.—

Stationery and Printing.

Commercial and industrial intelligence.

Stores.

Factories Act.

The general encouragement of industries.

Technical and industrial education.

Group III.—

Inventions and Designs.

Steam boilers Acts.

Electricity.

Ordnance Factories.

Inspection of ordnance manufactures.

Each of these should be under a separate member of the Industries Board, who would control the departments subordinate to him.

(139) In order to secure unity of administration, the headquarters of the Board should be with the Government of India, though its members should tour frequently.

(140) The Board and the Department should be assisted by a part-time Financial Adviser, who should be given a seat on the Board.

(141) An examination of the functions and qualifications of the officers subordinate to the Board, of the members of the Board itself, and of the higher provincial officers, shows that all require technical, business and administrative experience for the proper performance of their duties.

(142) It therefore seems necessary to create an Imperial Industrial Service to meet the requirements of the industrial departments throughout the country. This will also afford a means of training qualified Indians to fill the higher appointments.

(143) The ordnance factories, if they are to be managed by a civil department, should have their own separate service, though they may exchange officers with the Imperial Industrial Service.

(144) Officers of the Imperial Industrial Service should be recruited, as far as possible, in India.

(145) Before a regular Industrial Service has been built up, appointments will have to be made from various sources, often on special terms.

CONCLUSION.

We have briefly sketched the lines of economic development along which India has moved since the first came into contact with western traders; and have described in somewhat more detail the commercial and industrial position to which these lines of development have led her. We have shown that this position has become in many ways disadvantageous to the interests of the country; and that India's industrial equipment is impaired by deficiencies which affect the interests of national safety. The industrial system is unevenly, and in most cases inadequately, developed; and the capitalists of the country, with a few notable exceptions, have till now left to other nations the work and the profit of manufacturing her valuable raw materials, or have allowed them to remain unutilised. A powerful and well-directed stimulus is needed to start the economic development of India along the path of progress. Such a stimulus can only be supplied by an organised system of technical, financial, and administrative assistance.

Our report in its finally approved form was in the hands of the printers before the appearance of the Chelmsford-Montagu report on Indian constitutional reforms. We were unable, therefore, to re-examine in detail our conclusions and recommendations in the light of the reform proposals without incurring a delay which would have been undesirable. It is evident, however, that our scheme is in general accord with the administrative changes proposed by His Excellency the Viceroy and the Secretary of State.

We are deeply conscious of the difficulties of the question with which we have been asked to deal, and of its vital importance to the future of the country. We have had to discuss a vast range of subjects requiring expert knowledge, which was not always adequately available in the country under present conditions. The circumstances of India have made it necessary for us to devise proposals which will bring the State into far more intimate relations with industrial enterprise than the policy of Government or public opinion has hitherto permitted. But as regards our main proposals—technical education in practical relation to industrial requirements, the supply of advice and assistance through organised scientific and technical services, the provision of more liberal finance for industries, so far as possible through private agency—we feel confident that these are solutions clearly indicated by the very difficulties which they are designed to surmount, as well as by the small degree of Indian experience available, and substantially supported by the best-qualified opinion of the country. Finally, we have been strongly impressed by the earnest demand throughout India

for economic progress and by the growing realisation of the dangers to which industrial unpreparedness exposes a nation. We feel sure that the strongest support will be forthcoming from the public generally, and from Indian capitalists and industrialists in particular, to any well-considered scheme for industrial progress which Government may see fit to adopt, and we submit our report in the earnest hope that our recommendations will, with the approval of Government and the good-will of the Indian public, help in some measure towards the ideal of an India, strong in her own strength, and a worthy partner in Empire.

(Signed) T. H. HOLLAND,
President.

" ALFRED CHATTERTON.

" FAZULBHOY CURRIMBHOY.

" C. E. LOW.

" M. M. MALAVIYA.*

" R. N. MOOKERJEE.

" F. H. STEWART.

" D. J. TATA.

R. D. BELL,
G. H. W. DAVIES, } *Secretaries.*

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* Subject to a separate note.

NOTE

BY

The Hon'ble Pandit Madan Mohan Malaviya.

Introductory.

On the 21st March 1916, the Hon'ble Sir Ibrahim Rahimtoola moved a Resolution in the Imperial Legislative Council urging the appointment of a Committee to consider and report what measures should be adopted for the growth and development of industries in India. Among the matters which he suggested might suitably be referred for the consideration of the Committee, he put in the forefront the question :—

" Whether representation should be made to the authorities through the Secretary of State for India for securing to the Government of India full fiscal autonomy, specially in reference to import, export and excise duties."

In the course of his speech in supporting the Resolution, the Hon'ble Member laid great stress on this point. He said :—

" I readily recognise that efforts are being made by the Government in many directions to meet the needs of the situation. It appears to me, however, that, unless the hands of the Imperial Government are free in fiscal matters, the results will not be adequate. If the Government of India were free to adopt measures solely in the interests of the people of this country, without any restrictions or limitations in fiscal matters, our industrial development would be in a fair way of successful accomplishment. India wants fiscal autonomy as the first step towards her industrial regeneration, and if Indian public opinion is to have any weight in the determination of this question, we ought to get it at once."

The Hon'ble Sir William Clark, the then Member for Commerce and Industry, accepted the Resolution on behalf of the Government. He announced that the Government had anticipated the recommendation of the Resolution, and had already taken steps to constitute not a committee, but a more important body, a Commission, whose duty it will be to consider and report upon the possibility of further industrial development in this country. He said at the same time that, for reasons which he put before the Council, the scope of the enquiries entrusted to the Commission would not include a consideration of the question of fiscal policy of the Government. Sir William Clark noted that in the opinion of the mover of the Resolution " a Government of India, uncontrolled by the Secretary of State, untrammelled by the conceptions of fiscal policy which may be held by the British Government of the day, would be a far more potent instrument for the development of industries in India than the administration of this country under its present con-

stitution." He also recognised that there was " a weighty body of opinion tending in that direction." But he said that " His Majesty's Government feel that the fiscal relationships of all parts of the Empire as between one another and the rest of the world, must be reconsidered after the war, and they wish to avoid the raising of all such questions until that fortunate time shall have arrived." It was therefore stated in the Resolution appointing this Commission that " any consideration of the present fiscal policy of the Government has been excluded from its enquiries," and that " the same considerations apply with even greater force to any proposals involving the imposition of duties for the specific purpose of protecting the Indian industries, a policy which would very directly affect the fiscal relations of India with the outside world." This will explain why, as Sir Frederick Nicholson put it in his statement submitted to us, ' the part of Hamlet must be totally omitted.'

The Commission has been instructed to examine and report upon the possibilities of further industrial development in India and to submit its recommendations with special reference to the following questions :—

" (*a*) whether new openings for the profitable employment of Indian capital in commerce and industry can be indicated ;

" (*b*) whether and, if so, in what manner, Government can usefully give direct encouragement to industrial development—

" (*i*) by rendering technical advice more freely available ;

" (*ii*) by the demonstration of the practical possibility on a commercial scale of particular industries ;

" (*iii*) by affording directly or indirectly financial assistance to industrial enterprises or

" (*iv*) by any other means which are not incompatible with the existing fiscal policy of the Government of India."

In the course of the speech to which reference has been made, Sir William Clark made it clear that " the building up of industries where the capital, control and management should be in the hands of Indians " was " the special object which we all have in view." He emphasised that it was of immense importance alike to India herself and to the Empire as a whole, that Indians should take a larger share in the industrial development of their country. He deprecated the taking of any steps, if it might " merely mean that the manufacturer who now competes with you from a distance would transfer his activities to India and compete with you within your boundaries." It was the same object of finding out how to help *Indians* to develop industrial and commercial enterprise, that led the Government of India to depute Professor C. J. Hamilton, the Minto Professor of Economics in Calcutta, to visit Japan " to obtain more detailed particulars for the use of the Industrial Commission," so that we may " know exactly what her Government has done to aid her people in the notable advance which they have made," having " developed a structure of modern industrial and commercial enterprise from a past which knew nothing of western economic conditions." We have to keep this object clearly before our mind in dealing with the questions which we have to examine and report upon.

India—Past and Present.

In the revised note which Professor Hamilton submitted to the Commission, after dwelling on the rapidity with which Japan has transformed herself from a country where "agriculture absorbed the energies of the bulk of the population" to one of the important manufacturing countries of modern times, he says:—

"The second fact, even more arresting from an Indian point of view, is that this remarkable transformation has been achieved by an Asiatic community. The Asiatics have long been regarded as intensely conservative, unprogressive, needing the help and guidance of western nations for the maintenance of law and order, and, even with their assistance, being with difficulty persuaded to adopt the modern aims and methods associated with economic progress."

Mr. Hamilton does not stand alone in this view. In the course of my work connected with this Commission, I have repeatedly been reminded of the erroneous notion which many a European holds that India is, and must remain, a mainly agricultural country, that the people of India are by nature and tradition deficient in industrial capacity and commercial enterprise, and that these qualities are inherent in the nations of the West. It is necessary to combat this notion, for it vitiates judgment regarding the capacity of Indians. It is also necessary for a proper appreciation of the present industrial condition of India and of the possibilities of its future development, that the facts and circumstances of the past should be correctly known and appreciated.

I agree with my colleagues that "at a time when the west of Europe, the birthplace of the modern industrial system, was inhabited by uncivilised tribes, India was famous for the wealth of her rulers and for the high artistic skill of her craftsmen," and that "even at a much later period when traders from the West made their first appearance in India, the industrial development of this country was at any rate not inferior to that of the more advanced European nations." But I do not agree with them as to the causes which they assign for the subsequent growth of industries in England, and, by implication, for the want of the growth of such industries in India. They say:—

"But the widely different social and political conditions of the West had helped the middle class to establish itself on a foundation of commercial prosperity, and the struggles for political freedom and religious liberty in which it had taken its share had endowed it with a spirit of enquiry and enterprise that was gradually and increasingly directed to the attainment of industrial efficiency," and that "it was to this middle class that the so-called 'industrial revolution' of the eighteenth century was mostly due." (Paragraph 1 of the Report.)

Similarly it is stated in paragraph 134 of the Report that:—

"The history of the evolution in the West of new industrial methods which culminated in the rapid and striking changes of the latter half of the eighteenth century shows that a large part was played therein by the educated as well as by the capitalist classes. The encouragement of scientific research and its practical application by the Royal Society, and at a later stage by the Society of Arts, was closely paralleled by the fresh industrial ventures constantly being set on foot by merchants and other persons with capital at command. When the results began to reach India in the shape of machine-made imports, the movement had passed beyond the stage where the gradual evolution which in England had taken place could be readily imitated in India."

In my opinion this does not give a correct view of the matter, and is calculated to support erroneous ideas about the natural capacity of Indians and Europeans for industrial enterprise, and to stand in the way of right conclusions being reached as to the possibility of industrial development in India with the co-operation of the Government and the people. I must therefore refer a little more fully to the economic history of India and of the 'industrial revolution' of England which has greatly affected that history.

India—A Manufacturing as well as an Agricultural Country.

"The skill of the Indians," says Professor Weber, "in the production of delicate woven fabrics, in the mixing of colours, the working of metals and precious stones, the preparation of essences and in all manner of technical arts, has from early times enjoyed a world-wide celebrity." There is evidence that Babylon traded with India in 3000 B.C. Mummies in Egyptian tombs, dating from 2000 B.C., have been found wrapped in Indian muslin of the finest quality. "There was a very large consumption of Indian manufactures in Rome. This is confirmed by the elder Pliny, who complained that vast sums of money were annually absorbed by commerce with India." "The muslins of Dacca were known to the Greeks under the name of *Gangetika*. . . . Thus it may be safely concluded that in India the arts of cotton spinning and cotton weaving were in a high state of proficiency two thousand years ago. . . . Cotton weaving was only introduced into England in the seventeenth century."—(*Imperial Gazetteer of India*, Volume III, page 195.)

As regards iron manufactures, Professor Wilson says:—"Casting iron is an art that is practised in this manufacturing country (England) only within a few years. The Hindus have the art of smelting iron, of welding it, and of making steel, and have had these arts from time immemorial." Mr. Ranade wrote in 1892:—

"The iron industry not only supplied all local wants, but it also enabled India to export its finished products to foreign countries. The quality of the material turned out had also a world-wide fame. The famous Iron Pillar near Delhi, which is at least fifteen hundred years old, indicates an amount of skill in the manufacture of wrought iron, which has been the marvel of all who have endeavoured to account for it. Mr. Ball (late of the Geological Survey of India) admits that it is not many years since the production of such a pillar would have been an impossibility in the largest factories in the world, and, even now, there are comparatively very few factories where such a mass of metal could be turned out. Cannons were manufactured in Assam of the largest calibre. Indian *wootz* or steel furnished the materials out of which Damascus blades with a world-wide reputation were made; and it paid Persian merchants in those old times to travel all the way to India to obtain these materials and export them to Asia. The Indian steel found once considerable demand for cutlery even in England. This manufacture of steel and wrought iron had reached a high perfection at least two thousand years ago." —(Ranade's *Essays on Indian Economics*, pages 159-160.)

There is abundant testimony to prove that at the date of the invasion of Alexander, as for centuries before it, the people of India enjoyed a

high degree of prosperity, which continued to the breaking up of the Moghal Empire in the eighteenth century.

"All the descriptions of the parts of India visited by the Greeks," Mr. Elphinstone tells us, "give the idea of a country teeming with population, and enjoying the highest degree of prosperity . . . The numerous commercial cities and ports for foreign trade, which are mentioned at a later period (in the "Periplus") attest the progress of the Indians in a department which more than any other shows the advanced state of a nation. (Page 263). . . Arrian mentions with admiration that every Indian is free. . . . The army was in constant pay during war and peace . . . The police is spoken of as excellent. Megasthenes relates that in the camp of Sandracottus, consisting of 400,000 men, the sums stolen daily did not amount to more than about £3 . . . The fields were all measured, and the water carefully distributed for irrigation; taxes were imposed upon trade, and an income-tax levied from merchants and traders. Royal roads are spoken of by Strabo and mile-stones . . . Gold and gems, silks and ornaments were in all families; the professions mentioned show all that is necessary to civilised life. . . . The number of kinds of grains, spices, etc., which were grown afford proofs that the country was in a high state of cultivation. . . . Their internal institutions were less rude; their conduct to their enemies more humane; their general learning much more considerable; and, in the knowledge of the being and nature of God, they were already in possession of a light which was but faintly perceived, even by the loftiest intellects in the best days of Athens."—(*History of India*, page 52.)

The author of the "Periplus of the Erythrian Sea" fully describes Indian commodities for which there was a great demand in the West, especially at Rome, about the first century of Christ. Many a traveller from the West has similarly described the trade of India. In the fourth and the sixth centuries two Chinese travellers visited India, and have fully recorded their views on its material condition, which included flourishing arts and industries.

Then came the period of the Crusades and the first beginning of the Levantine trade which culminated in Venice becoming the greatest trader with India; and later on, Genoa. Marco Polo came here in the thirteenth century, and he also has left a record of his impressions.

The waves of conquest which commenced from the eleventh century no doubt greatly hampered Indian industrialists and industries for some time. But the establishment of the Moghal Empire and the safety and security of the reign of Akbar seem to have fully revived Indian industries and handicrafts. Bernier, who visited India in the reign of Shahjahan, gives a glowing description of his capital. He speaks of his immense treasures, gold and silver and jewellery, "a prodigious quantity of pearls and precious stones of all sorts" . . . and marvels over the incredible quantity of manufactured goods. "Embroideries, streaked silks, tufts of gold turbans, silver and gold cloth, brocades, net-work of gold," etc. . . . Tavernier also gives a long description of the manufactured goods, and dwells with wonder on the "marvellous peacock-throne, with the natural colours of the peacock's tail worked out in jewels, of carpets of silk and gold, satins with streaks of gold and silver, endless lists of exquisite works, of minute carvings, and other choice objects of art."

The East India Company.

It was this trade and prosperity that lured the traders of Europe to India. As the historian Murray puts it:—"Its fabrics, the most beauti-

ful that human art has anywhere produced, were sought by merchants at the expense of the greatest toils and dangers." (*History of India*. page 27.) After the decline of Venice and Genoa, the Portuguese and the Dutch captured the Indian trade. The merchants of England viewed their trade with envious eyes, and formed the East India Company which obtained its charter from Queen Elizabeth on 31st December 1600, to trade with the East Indies, not "to exchange as far as possible the manufactured goods of England for the products of India" (Report, para. 2)—for there were few English manufactures then to be exported—but to carry the manufactures and commodities of India to Europe.

"At the end of the seventeenth century," says Lecky, "great quantities of cheap and graceful Indian calicoes, muslins and chintzes were imported into England, and they found such favour that the woollen and silk manufacturers were seriously alarmed. Acts of Parliament were accordingly passed in 1700 and 1721 absolutely prohibiting, with a very few specified exceptions, the employment of printed or dyed calicoes in England, either in dress or in furniture, and the use of any printed or dyed goods, of which cotton formed any part."—(Lecky's *History of England in the Eighteenth Century*.)

When Clive entered Murshidabad, the old capital of Bengal, in 1757, he wrote of it :—

"This city is as extensive, populous, and rich as the city of London, with this difference that there were individuals in the first possessing infinitely greater property than in the last city."—(H. J. S. Cotton. in *New India*, published before 1890.)

"Less than a hundred years ago," wrote Sir Henry Cotton in 1890, "the whole commerce of Dacca was estimated at one crore of rupees, and its population at 200,000 souls. In 1787 the exports of Dacca muslin to England amounted to 30 lakhs of rupees; in 1817 they had ceased altogether. The arts of spinning and weaving, which for ages afforded employment to a numerous and industrial population, have now become extinct. Families which were formerly in a state of affluence have been driven to desert the town and betake themselves to the villages for a livelihood. The present population of the town of Dacca is only 79,000. This decadence has occurred not in Dacca only, but in all districts. Not a year passes in which the Commissioners and District Officers do not bring to the notice of Government that the manufacturing classes in all parts of the country are becoming impoverished."

"In the first four years of the nineteenth century," says Mr. Romesh Chandra Dutta, "in spite of all prohibitions and restrictive duties, six to fifteen thousand bales of cotton piece-goods were annually shipped from Calcutta to the United Kingdom. The figure rapidly fell down in 1813. The opening of trade to private merchants in that year caused a sudden rise in 1815; but the increase was temporary. After 1820 the manufacture and export of cotton piece-goods declined steadily; never to rise again."—(*Economic History of British India*, page 296.)

How India came to be an Agricultural Country.

At an early period of the Company's administration, British weavers had begun to be jealous of the Bengal weavers, whose silk fabrics were imported into England, and so not only were Indian manufactures shut out from England, but—

"a deliberate endeavour was now made to use the political power obtained by the East India Company," says Mr. Romesh Dutta, "to discourage the manufactures of India. In their letter to Bengal, dated 17th March, 1769, the Company desired that the manufacture of raw silk should be encouraged in Bengal, and that of manufactured silk fabrics should be discouraged. And they also recommended that the silk winders should be forced to work in the Company's factories and prohibited from working in their own homes."

In a letter of the Court of Directors, quoted in Appendix 37 to the Ninth Report of the House of Commons Select Committee on the Administration of Justice in India, 1783 (quoted by Mr. Romesh Dutta at page 45 of his book), it was stated :—

"This regulation seems to have been productive of very good effects, particularly in bringing over the winders, who were formerly so employed, to work in the factories. Should this practice (the winders working in their own homes) through inattention have been suffered to take place again, it will be proper to put a stop to it, which may now be more effectually done, by an absolute prohibition under severe penalties, by the authority of the Government."

"This letter," as the Select Committee justly remarked, "contains a perfect plan of policy, both of compulsion and encouragement which must in a very considerable degree operate destructively to the manufactures of Bengal. Its effects must be (so far as it could operate without being eluded) to change the whole face of the industrial country, in order to render it a field for the produce of crude materials subservient to the manufactures of Great Britain."—(*Ibid.*)

Furthermore, according to Mr. Digby, in 1813, Indian cotton manufactures were liable to the following charges in England :—

	£	s.	d.
Calicoes or dimities for every £100 of value	81	2	11
Cotton, raw (per 100 lbs.)	0	16	11
Cotton, manufactured	81	2	11
Hair or goat's wool, manufactures of, per cent. . .	84	6	3
Flowered or stitched muslins of white calicoes (for every £100 in value)	32	9	2
Other manufactures of cotton not otherwise charged .	32	9	2

"These burdensome charges were subsequently removed, but only after the export trade in them had, temporarily or permanently, been destroyed." (*Prosperous British India*, page 90.) On the other hand, ever since English power was established in India, English goods entered India either with no import, or with a merely nominal import duty. At the time Indian cotton goods were liable to the heavy duty of £81 per cent. in England, English cotton goods imported into India were subject to a duty of only 2½ per cent. In addition to this, the steam engine and the power loom had in the meantime been perfected in England, and English manufactures had begun to come in increasing quantities to India. The result was well described by Mr. Henry St. George Tucker, who had, on retirement from India, become a Director of the East India Company. Writing in 1823, he said :—

"The silk manufactures, (of India) and its piece-goods made of silk and cotton intermixed, have long since been excluded altogether from our markets ; and, of late partly in consequence of the operation of a duty of 67 per cent., but chiefly from the effect of superior machinery, the cotton fabrics which heretofore constituted the staple of India, have not only been displaced in this country, but we actually export our cotton manu-

factures to supply a part of the consumption of our Asiatic possessions. India is thus reduced from the state of a manufacturing to that of an agricultural country."—[*Memorials of the Indian Government*, being a selection from the papers of Henry St. George Tucker (London 1853), page 494, quoted by Mr. Romesh Dutta at page 262 of his *Economic History of British India.*]

H. H. Wilson, the historian of India, also wrote as follows :—

" It was stated in evidence (in 1813) that the cotton and silk goods of India up to the period could be sold for a profit in the British market at a price from 50 to 60 per cent. lower than those fabricated in England. It consequently became necessary to protect the latter by duties of 70 and 80 per cent. on their value, or by positive prohibition. Had this not been the case, had not such prohibitory duties and decrees existed, the mills of Paisley and Manchester would have stopped in their outset, and could scarcely have been again set in motion, even by the power of steam. They were created by the sacrifice of the Indian manufacture. Had India been independent, she would have retaliated, would have imposed prohibitive duties upon British goods, and would thus have preserved her own productive industry from annihilation. This act of self-defence was not permitted her ; she was at the mercy of the stranger. British goods were forced upon her without paying any duty, and the foreign manufacturer employed the arm of political injustice to keep down and ultimately strangle a competitor with whom he could not have contended on equal terms."—(Quoted by Romesh Dutta, *Ibid*, pages 262-263.)

Another important Indian industry which succumbed to the jealousy of English manufacturers, was ship-building. That ship-building was an ancient industry in India, and that Indians carried on navigation to far distant climes east and west, has been fully established by Dr. Radhakumud Mukerjee in his valuable " History of Indian Shipping." Both Darius and Alexander had hundreds of vessels constructed in India. Indian rivercraft navigated Africa and went as far as Mexico. Again from the Coromandel Coast Indians navigated as far as Java, Sumatra, Borneo and distant Canton.

" A hundred years ago," says Mr. Digby, " ship-building was in so excellent a condition in India that ships could be (and were) built which sailed to the Thames in company with British-built ships and under the convoy of British frigates."

The Governor-General (Lord Wellesley) reporting in 1800 to his masters in Leadenhall Street, London, said :—

" The port of Calcutta contains about 10,000 tons of shipping, built in India, of a description calculated for the conveyance of cargoes to England . . . From the quantity of private tonnage now at command in the port of Calcutta, from the state of perfection which the art of ship-building has already attained in Bengal (promising a still more rapid progress and supported by abundant and increasing supplies of timber), it is certain that this port will always be able to furnish tonnage, to whatever extent may be required for conveying to the port of London the trade of the private British merchants of Bengal."—(Quoted by Mr. Digby in *Prosperous British India*, page 86.)

But, says Mr. Taylor :—

" The arrival in the port of London of Indian produce in Indian-built ships created a sensation among the monopolists which could not have been exceeded if a hostile fleet had appeared in the Thames. The ship-builders of the port of London took the lead in raising the cry of alarm ; they declared that their business was on the point of ruin, and that the families of all the shipwrights in England were certain to be reduced to starvation."—(*History of India*, page 216.)

The cry prevailed. The Court of Directors opposed the employment of Indian ships in the trade between England and India. In doing so,

says Mr. Digby, they employed an argument which, in some of its terms, sounds very curious at the present time, when so many lascars are employed by all the great lines of steamers running to the East. After reciting other reasons against ship-building and ship-manning in India, the Court said in their despatch, dated 27th January, 1801 :—

"XVII. Besides these objections which apply to the measure generally, there is one that lies particularly against ships whose voyages commence from India, that they will usually be manned in great part with lascars or Indian sailors. Men of that race are not by their physical frame and constitution fitted for the navigation of cold and boisterous latitudes; their nature and habits are formed to a warm climate, and short and easy voyages performed within the sphere of periodical winds; they have not strength enough of mind or body to encounter the hardships or perils to which ships are liable in the long and various navigation between India and Europe, especially in the winter storms of our northern seas, nor have they the courage which can be relied on for steady defence against an enemy . . . But this is not all. The native sailors of India are . . . on their arrival here, led into scenes which soon divest them of the respect and awe they had entertained in India for the European character . . . The contemptuous reports which they disseminate on their return cannot fail to have a very unfavourable influence upon the minds of our Asiatic subjects, whose reverence for our character, which has hitherto contributed to maintain our supremacy in the East, will be gradually changed . . . and the effects of it may prove extremely detrimental . . . Considered, therefore, in a physical, moral, commercial, and political view, the apparent consequences of admitting these Indian sailors largely into our navigation, form a strong additional objection to the concession of the proposed privilege to any ship manned by them."—(Appendix No. 47—Supplement to Fourth Report, East India Company, pages 23-24, quoted by Mr. Digby in *Prosperous British India*," at pages 101-103.)

The lascars of to-day are only the successors of those who emerged from the ports of Kathiawar and navigated from thence to Aden and Mocha to the East African coast and to the Malay Peninsula. It is possible an Indian lascar in the early nineteenth century, finding himself in London, may have indulged himself just as Jack to-day does, when he lands in any important Indian port. But it cannot but be regretted that such small considerations were allowed to weigh at all against Indian navigation to England. And it is difficult to express in words the economic and political losses which this attitude has meant for England as well as India. How much better would have been the position of India, how infinitely stronger that of England, if Indian shipping had been allowed to grow, and had grown as shipping in other countries has grown during the last forty years, and been available to India and the Empire in this hour of need.

Mr. Romesh Dutta has shown in his "Economic History of British India" that this continued to be the settled policy of England towards India for fifty years and more; that it was openly avowed before the House of Commons and vigorously pursued till 1833 and later; and that it effectually stamped out many of the national industries of India for the benefit of English manufactures. Mr. Arnold Toynbee has expressed the same view :—

"English industries would not have advanced so rapidly without protection, but the system, once established led to perpetual wrangling on the part of rival industries, and sacrificed India and the Colonies to our great manufactures."—(*The Industrial Revolution of the Eighteenth Century in England*, by Arnold Toynbee, page 58.)

English Industrial Revolution.

Let us now turn to England to see what happened there during the same period. The industrial revolution, which has powerfully affected Indian industries, is said to have begun in England in 1770 :—

"In 1770," says Mr. Cunningham, "there was no Black Country, blighted by the conjunction of coal and iron trades ; there were no canals or railways, and no factory towns with their masses of population. All the familiar features of our modern life, and all its most pressing problems, have come to the front within the last century and a quarter."—(*The Growth of English Industry and Commerce*, by W. Cunningham, Part II, page 613.)

Up to the middle of the eighteenth century English industry was in a very backward condition. The state of that industry is thus described by John Richard Green :—

"Though England already stood in the first rank of commercial states at the accession of George the Third, her industrial life at home was mainly agricultural. The wool trade had gradually established itself in Norfolk, the West Riding of Yorkshire and the countries of the south west ; while the manufacture of cotton was still almost limited to Manchester and Bolton, and remained so unimportant that in the middle of the eighteenth century the export of cotton goods hardly reached the value of fifty thousand a year. There was the same slow and steady progress in the linen trade of Belfast and Dundee and the silks of Spitalfields. The processes of manufacture were too rude to allow any large increase of production . . . But had the processes of manufacture been more efficient, they would have been rendered useless by the want of a cheap and easy means of transport. The older main roads had broken down. The new lines of trade lay often along mere country lanes which had never been more than horse-tracks . . . A new era began when the engineering genius of Brindley joined Manchester with its port of Liverpool in 1767 by a canal ; the success of the experiment soon led to the universal introduction of water-carriage, and Great Britain was traversed in every direction by three thousand miles of navigable canals. At the same time the new importance was given to coal which lay beneath the soil of England. The stores of iron which had lain side by side with it in the northern countries had lain there unworked through the scarcity of wood, which was looked upon as the only fuel by which it could be smelted In the middle of the eighteenth century a process for smelting iron with coal turned out to be effective ; and the whole aspect of the iron trade was at once revolutionised. Iron was to become the working material of the modern world ; and it is its production of iron which more than all else has placed England at the head of industrial Europe. The value of coal as a means of producing mechanical force was revealed in the discovery by which Watt in 1766 transformed the steam engine from a mere toy into the most wonderful instrument which human industry has ever had at its command . . . Three successive inventions in twelve years, that of the spinning jenny in 1764 by the weaver Hargreaves, of the spinning machine in 1768 by the barber Arkwright, of the 'mule' by the weaver Crompton in 1776, were followed by the discovery of the power loom. But these would have been comparatively useless had it not been for the revelation of a new inexhaustible labour-force in the steam engine. It was the combination of such a force, with such means of applying it, that enabled Britain during the terrible years of her struggle with France and Napoleon to all but monopolize the woollen and cotton trades, and raised her into the greatest manufacturing country that the world had seen."—(Green's *Short History of the English People*, pages 791-92.)

But as Mr. Cunningham has pointed out :—

"Inventions and discoveries often seem to be merely fortuitous ; men are apt to regard the new machinery as the outcome of a special and unaccountable burst of inventive genius in the eighteenth century. But . . . to point out that Arkwright and Watt were fortunate in the fact that the times were ripe for them, is not to detract from their merits. There had been many ingenious men from the time of William Lee and Dodo Dudley ; but the conditions of their day were unfavourable to their success. The introduction of expensive implements, or processes, involves a large outlay ; it is not worth while for any man, however energetic, to make the attempt, unless he has a considerable command of capital, and has access to large markets. In the eighteenth century these conditions were being more and more realised. The institution of the

Bank of England, and of other Banks, had given a great impulse to the formation of capital: and it was much more possible than it had ever been before for a capable man to obtain the means of introducing costly improvements in the management of his business."—(*Growth of English Industry and Commerce*, Part II, page 610.)

The Bank of England had been formed in 1694 as an instrument for procuring loans from the people at large by the formal pledge of the State to repay the money advanced on the demand of the lender.

" But for more than sixty years after the foundation of the Bank, its smallest note had been for £20, a note too large to circulate freely, and which rarely travelled far from Lombard Street. Writing in 1790, Burke said that when he came to England in 1750, there were not ' twelve bankers' shops ' in the provinces, though then (in 1790) he said, they were in every market town. Thus the arrival of the Bengal silver not only increased the mass of money, but stimulated its movement; for at once, in 1759, the bank issued £10 and £15 notes, and in the country private firms poured forth a flood of paper."—(Brooks Adams *The Law of Civilization and Decay*, pages 263-264—quoted by Mr. Digby at page 33 of his book.)

" In 1756, when Clive went to India, the nation owed £74,575,000, on which it paid an interest of £2,753,000. In 1815 this debt had swelled to £861,000,000, with an annual interest charge of £32,645,000." (*Ibid*, page 33) . . . " The influx of the Indian treasure, by adding considerably to the nation's cash capital, not only increased its stock of energy but added much to its flexibility and the rapidity of its movement." (*Ibid*, page 31.) . . . " Very soon after Plassey, the Bengal plunder began to arrive in London, and the effect appears to have been instantaneous, for all authorities agree that the ' industrial revolution,' the event which has divided the nineteenth century from all antecedent time, began with the year 1760. Prior to 1760, according to Baines, the machinery used for spinning cotton in Lancashire was almost as simple as in India; while about 1750 the English iron industry was in full decline because of the destruction of the forests for fuel. At that time four-fifths of the iron used in the kingdom came from Sweden."

" Plassey was fought in 1757, and probably nothing has ever equalled the rapidity of the change which followed. In 1760 the flying-shuttle appeared, and coal began to replace wood in smelting. In 1764 Hargreaves invented the spinning jenny, in 1779 Crompton contrived the mule, in 1785 Cartwright patented the power loom, and, chief of all, in 1768 Watt matured the steam engine, the most perfect of all vents of centralising energy. But, though those machines served as outlets for the accelerating movement of the time, they did not cause the acceleration. In themselves inventions are passive, many of the most important having lain dormant for centuries, waiting for a sufficient store of force to have accumulated to set them working. That store must always take the shape of money, and money not hoarded, but in motion."—(Brooks Adams *The Law of Civilization and Decay*, pages 259-260.)

Money came from India. Mr. Digby says in his " Prosperous British India ":—

" England's industrial supremacy owes its origin to the vast hoards of Bengal and the Karnatik being made available for her use. . . . Before Plassey was fought and won, and before the stream of treasure began to flow to England, the industries of our country were at a very low ebb. Lancashire spinning and weaving were on a par with the corresponding industry in India so far as machinery was concerned; but the skill which had made Indian cottons a marvel of manufacture was wholly wanting in any of the Western nations. As with cotton so with iron; industry in Britain was at a very low ebb, alike in mining and in manufacture."—(*Ibid*, pages 30-31.)

Though the power loom was constructed in 1784, power weaving did not become a practical success until the dressing-frame was invented in 1803. Up to 1801, the cotton goods sent out from England to India amounted in value to £21,000; by 1813 they had risen to £108,824. When the charter of the East India Company was renewed in that year, its monopoly of trade with India was abolished, and British traders obtained a fresh outlet into this extensive Empire. The enormous increase of the imports of English manufactured cottons into India in

subsequent years hardly needs description. By the end of the century, India had become the largest single market for them, its demands for British cotton goods having been just under £20,000,000. In the year before the war they had risen to £44,581,000.

Effects of Exports of Raw Produce.

Another factor which has powerfully contributed to India becoming more and more agricultural is the policy pursued by the British Government in India of encouraging the exports of its raw produce. Paragraph 5 of our Report has discussed the effects of these exports and that of the advent of the railway and the steamship. But it seems to me that, for an adequate appreciation of the results, the matter requires to be treated at greater length.

In the eighteenth century the Colonies of England were looked upon as "plantations" where raw produce was grown to be sent to the mother country, to be manufactured and sent back to the Colonies and to the rest of the world. After the American War of Independence the new Colonies were allowed to work out their own destinies, and they began to develope their manufacturing power by protection even against British manufactures. Since then, in the expressive language of Mr. Ranade :—

"The great Indian Dependency of England has come to supply the place of the old Colonies. This Dependency has come to be regarded as a Plantation, growing raw produce to be shipped by British agents in British ships, to be worked into Fabrics by British skill and capital, and to be re-exported to the Dependency by British merchants to their corresponding British Firms in India and elsewhere."—(*Essays*, page 99.)

This is best illustrated by the case of cotton. The Court of Directors of the East India Company began so early as 1788 to take an interest in the question of the cultivation of cotton in India, and expended considerable sums in various attempts to stimulate its growth. Since 1858, the Government of India have, at the instance of British manufacturing interests, taken steps from time to time, to improve the quality and quantity of cotton produced in India. The latest evidence of this is the appointment of the Indian Cotton Committee of last year. I do not complain that this has been done. On the contrary, I think enough has not been done in this direction. I think India can grow, and ought to be helped to grow, much more and better cotton, and should be able to help both England and herself with it. But my point is that the policy which the Government has hitherto pursued has been one of encouraging the exports of raw produce. Its policy has not been to encourage the conversion of our raw cotton into manufactures. The doctrines of free trade and of *laissez faire*, and an undue regard for English interests and the fear of interference with English trade, have prescribed the policy which it has had to pursue.

Railways and Commerce.

The construction of railways in India was mooted by the first Lord Hardinge. He left a minute in 1848, and his successor, Lord Dalhousie,

took up the subject. It was in 1853 that Lord Dalhousie wrote his great Railway minute and gave the first stimulus to railway construction. India is indebted to him for the railway, as also for the telegraph. Says his eminent biographer, Sir William Hunter :—

"This was Lord Dalhousie's masterly idea—not only would he consolidate the newly annexed territories of India by his railways, and immensely increase the striking power of his military forces at every point of the Empire, but he would use a railway construction as a bait to bring British capital and enterprise to India on a scale which had never entered the imagination of any previous Governor-General.

"In all these arrangements," continues Sir William Hunter, "Lord Dalhousie had from the outset a vigilant eye to the mercantile aspects of his railway routes. 'The commercial and social advantages,' he wrote in his masterly minute on Railways, 'which India would derive from their establishment are, I truly believe, beyond all present calculation. Great tracts are teeming with produce they cannot dispose of. Others are scantily bearing what they would carry in abundance, if only it could be conveyed whither it is needed. England is calling aloud for the cotton which India does already produce in some degree, and would produce sufficient in quality, and plentiful in quantity, if only there were provided the fitting means of conveyance for it from distant plains to the several parts adopted for its shipment. Every increase of facilities for trade has been attended, as we have seen, with an increased demand for articles of European produce in the most distant markets of India; and we have yet to learn the extent and value of the interchange which may be established with people beyond our present frontier, and which is yearly and rapidly increasing. Ships from every part of the world crowd our ports in search of produce which we have, or could obtain in the interior, but which at present we cannot profitably fetch thence; and new markets are opening to us on this side of the globe under circumstances which defy the foresight of the wisest to estimate their probable value or calculate their future extent.'

"Lord Dalhousie provided free play for the mercantile possibilities of the railways by removing the previous checks and hindrances on Indian trade. Sir Edwin Arnold sums up these measures in a pithy marginal note :—'All ports in India made free.'

"The unprecedented impulse which Lord Dalhousie thus gave to Indian trade may be realized by the following figures. During his eight years of rule the export of raw cotton more than doubled itself from 1½ millions sterling to close on 3½ millions. The export of grain multiplied by more than threefold from £890,000 in 1848 to £2,900,000 in 1856 . . . The total exports of merchandise rose from 13½ millions sterling in 1848 to over 23 millions in 1856.

"The vast increase of productive industry, represented by these figures, enabled the Indian population to purchase the manufactures of England on an unprecedented scale. The imports of cotton goods and twist into India rose from three millions sterling in 1848 to 6⅓ millions in 1856. The total imports of merchandise and treasure increased during the eight years from 10¼ to 25¼ millions."—(*Dalhousie*, Rulers of India Series by Sir W. W. Hunter, pages 191, 193-196.)

I am fully alive to the advantages which railways have conferred on India. I have quoted from Sir William Hunter to show how their introduction affected Indian industries. As Lord Dalhousie's minute shows, one of the objects which they were intended to serve was the promotion of English trade and commerce with India. That was then the policy of the Government. I do regret that it was not then also the policy of Government to promote Indian industries, for then India would have prospered as well as England. It is particularly to be regretted that when they decided to develope a vast system of railways in India, they did not also decide to develope the iron and steel industry. For if they had done so, there would have been a much greater and more rapid extension of railways, because they would have cost India much less—according to official testimony, the price of iron was increased fifty per cent. by reason of freight and landing charges—and would have spelled

much greater benefits to the country than they have. The adoption of such a policy had been urged long ago both by Indians and by Englishmen. In a paper which he read before the Industrial Conference at Poona in 1893, Mr. Ranade said :—

"Many years ago Captain Townsend of the Ordnance Department observed in his work on the Mineral Wealth of India that nothing strikes the stranger who studies Indian economy so much as the contrast between the bounty of Nature and the poverty of Man in the matter of this iron industry. Endowed more richly in iron ore than almost any other country in the world, India has, in a commercial sense, no iron industry at all."—(*Essays*, pages 158-159.)

"Mr. Ball, Deputy Superintendent of the Geological Survey, in his work on Economic Geology observes that if the Government had started the manufacture of iron on an extended scale at the time of the first opening of the railways, great benefits would have accrued to the State. If the State was justified in undertaking the construction of its own railways, there was nothing inconsistent with principle in its undertaking the manufacture of its own iron any more than in its manufacture of salt or opium. The effect of its establishing factories for iron manufacture throughout India would have, in Mr. Ball's opinion, enabled the State to keep vast sums of money in circulation, and would have given employment to large numbers of people who now resort to agriculture as their only resource The golden opportunity was allowed to pass, and we find ourselves in the anomalous situation that after one hundred and fifty years of British rule, the iron resources of India remain undeveloped, and the country pays about ten* crores of rupees yearly for its iron supply, while the old race of iron smelters find their occupation gone."—(*Essays*, pages 164-165.)

That this could have been done is proved by the success of the great Tata Iron and Steel Works. The Government have earned the gratitude of Indians by the support they gave to the scheme, and it is a matter of great satisfaction that the firm has rendered signal services to the Government and the Empire during this war by a ready supply of rails and shell steel for use in Mesopotamia and Egypt. But if the Government had taken up the question of the manufacture of iron and steel when the schemes of railways were projected, or even later, the industry would have been established in the country much earlier and the entire industrial prospect of the country would have been altered and improved. It was not done, because, unfortunately for India, it was not the policy of the Government then to promote Indian industries.

I have dwelt at some length upon these facts to remind my English fellow-subjects how largely England is indebted for her "industrial efficiency" and prosperity to her connection with India, and how grave an economic wrong has been done to India by the policy pursued in the past, with the object that this should induce them the more to advocate and insist upon a truly liberal policy towards India in the future. I have also done this to dispel the idea that Indians are to blame for the decline of their indigenous industries, or that they suffer from any inherent want of capacity for industrial development on modern lines, and that Europeans are by nature more fitted than Asiatics for success in manufacturing pursuits. I have shown that up to the middle of the eighteenth century England herself was an agricultural country ; that for thousands of years and up to the beginning of the last century India excelled in manufactures as well as in agriculture, and that if during the century she came to be predominantly agricultural, this was due to the special

* The value of these imports had risen by 1913-14 to 25 crores.

treatment to which she had been subjected and not to any want of industrial capacity and enterprise among her people.

The Result—Frequent Famines.

The decline of Indian industries, the growing imports of British manufactures and the exports of raw produce from India, led inevitably to the impoverishment of the manufacturing classes in all parts of the country and drove a growing proportion of the population to depend more and more upon the land. Out of a total record export of 58¾ millions in 1878-79, only 6½ per cent. represented the value of what could properly be called manufactured goods, 93½ per cent. being mere raw produce. In 1880 the imports of manufactured goods were valued at £51,397,561. By the combined operation of these two causes the country was reduced to an economic condition which exposed it to the aggravated evils of frequent famines. Sir Horace Plunkett, whose inability to join us I most sincerely regret, pointed out in his valuable Report of the Recess Committee of 1896, that similar causes had led at an earlier period to similar results in Ireland. Speaking of the effect of legislation which had struck at all Irish industries, not excepting agriculture, he said :—

"It forced the population into entire dependence on the land and reduced the country to an economic condition involving periodical famines."

In India there were five famines between 1800 to 1825 ; two between 1825 to 1850 ; six between 1851 to 1875 ; eighteen between 1876 to 1900. According to Mr. Digby, the total mortality according to official records, between 1854 to 1901 was 28,825,000. Writing in 1901, Mr. Digby said :—

"Stated roughly, famines and scarcities have been four times as numerous during the last thirty years of the nineteenth century as they were one hundred years earlier, and four times more widespread."

I agree with my colleagues that, apart from the other advantages which railways have conferred upon India, they have had an important effect in lessening the disastrous results of famines. Grain can be carried to tracts affected by famine with much greater ease now than could be done before, and deaths from actual unavailability of food can be prevented. Since 1900, when the second Famine Commission, over which Sir Antony (now Lord) MacDonnell presided, made its report, the problem of famine relief and famine administration has also been placed on a satisfactory basis, and an admirable Famine Code has been drawn up. "In regard to palliatives much has been done ; but in respect of prevention, the hand has been slack." And this I regret to say, notwithstanding the fact that many of the remedies which we recommend to-day were recommended nearly forty years ago.

After the disastrous famine of 1877-78, the Government was pleased to appoint an Indian Famine Commission to enquire "how far it is possible for Government by its action, to diminish the severity of famines

or to place the people in a better condition for enduring them." In their Report the Commission said :—

" A main cause of the disastrous consequences of Indian famines, and one of the greatest difficulties in the way of providing relief in an effectual shape, is to be found in the fact that the great mass of the people directly depend on agriculture, and that there is no other industry from which any considerable part of the population derives its support. The failure of the usual rains thus deprives the labouring class, as a whole, not only of the ordinary supplies of food obtainable at prices within their reach, but also of the sole employment by which they can earn the means of procuring it. The complete remedy for this condition of things will be found only in the development of industries other than agriculture and independent of the fluctuations of the seasons."

The principal recommendations which that Commission made for the " encouragement of a diversity of occupations " among the people are so valuable, and so much in line with many of our own recommendations, that I reproduce them below. They said :—

" 1. We have elsewhere expressed our opinion that at the root of much of the poverty of the people of India, and of the risks to which they are exposed in seasons of scarcity, lies the unfortunate circumstance that agriculture forms almost the sole occupation of the mass of the population, and that no remedy for present evils can be complete which does not include the introduction of a diversity of occupations, through which the surplus population may be drawn from agricultural pursuits and led to find the means of subsistence in manufactures or some such employments."

And, after referring to the obstacles that then stood in the way of the investment of English capital in India, and after urging reasons why direct State aid could not then be given, they proceeded to say :—

" 6. There are, however, directions in which we have no doubt the Government might usefully aid in fostering the inception of new industries. The introduction of tea cultivation and manufacture is an instance of the successful action of the Government which should encourage further measures of a like character In this case, the Government started plantations, imported Chinese workmen, distributed seed, and brought the industry into a condition in which its commercial success was no longer doubtful. It then retired from any share in it, sold its plantations, and left the field to private capitalists. The cultivation of cinchona is a measure of a somewhat similar description though it has not yet passed entirely into the hands of private persons.

" 7. In treating of the improvement of agriculture, we have indicated how we think the more scientific methods of Europe may be brought into practical operation in India by the help of specially trained experts, and the same general system may, we believe, be applied with success both to the actual operations of agriculture and to the preparation for the market of the raw agricultural staples of the country. Nor does there appear any reason why action of this sort should stop at agricultural produce, and should not be extended to the manufactures which India now produces on a small scale or in a rude form, and which with some improvement might be expected to find enlarged sales, or could take the place of similar articles now imported from foreign countries.

" 8. Among the articles and processes to which these remarks would apply may be named the manufacture and refining of sugar ; the tanning of hides ; the manufacture of fabrics of cotton, wool and silk ; the preparation of fibres of other sorts, and of tobacco ; the manufactures of paper, pottery, glass, soap, oils and candles.

" 9. Some of these arts are already practised with success at Government establishments, such as the tannery at Cawnpur, which largely supplies harness for the army, and the carpet and other manufactures carried on in some of the larger jails ; and these institutions form a nucleus, around which we may hope to see a gradual spread of similar industry. They afford practical evidence of the success of the arts practised, and are schools for training the people of the country in improved methods ; and so long as any such institutions fairly supply a Government want, which cannot be properly met otherwise, or carry on an art in an improved form, and therefore guide and educate private trade, their influence can hardly fail to be beneficial. The same may be said of the workshops of the Government and the railway companies which are essential for the special purposes for which they are kept up, and gradually train and disseminate a more skilled class of artizans.

10. The Government might further often afford valuable and legitimate assistance to private persons desiring to embark in a new local industry, or to develope and improve one already existing, by obtaining needful information from other countries or skilled workmen or supervision, and at the outset supplying such aid at the public cost. So far as the products of any industries established in India can be economically used by the Government, they might properly be preferred to articles imported from Europe, and generally the local markets should be resorted to for all requisite supplies that they can afford. We are aware that steps have been taken within the last few years to enforce these principles, but more can certainly be done, and greater attention may properly be paid to the subject.

"11. Otherwise than as above indicated, we do not think it desirable that the Government should directly embark in any manufacture or industry in an experimental way. Such experiments to be really successful or valuable must be carried out on a commercial basis. The conditions of any Government undertaking are rarely such as to give it this character, and the fear of incurring an undue expenditure on what is regarded as only an experiment will often lead to failure, which will be none the less mischievous because it was thus caused

"12. There is no reason to doubt that the action of Government may be of great value in forwarding technical, artistic, and scientific education, in holding out rewards for efforts in these directions, and in forming at convenient centres museums or collections by which the public taste is formed and information is diffused. The great industrial development of Europe in recent years has doubtless received no small stimulus from such agencies; and the duty of the Government in encouraging technical education is one to which the people of England are yearly becoming more alive, and which it is certain will be more adequately performed in the future. All the causes which render such action on the part of Governments desirable in Europe apply with greater force to India. Experience, however, is still wanting, even in England, as to how such instruction should be given, and for India it will be hardly possible at present to go beyond the training of ordinary workmen in the practice of mechanical or engineering manipulation.

"13. To whatever extent it is possible, however, the Government should give assistance to the development of industry in a legitimate manner, and without interfering with the free action of the general trading community, it being recognised that every new opening thus created attracts labour which would otherwise be employed to comparatively little purpose on the land, and thus sets up a new bulwark against the total prostration of the labour market, which in the present condition of the population follows on every severe drought."

The cry of Indians for the promotion of Technical Education and Indigenous Industries.

This valuable Report was published in 1880, but it seems that little heed was paid to its most important recommendations. Little was done to encourage indigenous industries; less to promote technical education. In the meantime the Indian National Congress, which was organised to focus Indian public opinion and to represent the wants and wishes of the Indian public to the Government, came into existence in 1885. At its third session in 1887 it passed the following resolution:—

"That having regard to the poverty of the people, it is desirable that the Government be moved to elaborate a system of technical education, suitable to the condition of the country, to encourage indigenous manufactures by a more strict observance of the orders, already existing, in regard to utilising such manufactures for State purposes, and to employ more extensively than at present, the skill and talents of the people of the country."

At its next session, in 1888, the Congress urged the appointment of a mixed Commission to enquire into the industrial condition of the country as a preliminary to the introduction of a general system of technical education. It reiterated this request in 1891, 1892 and 1893

In 1894 it affirmed in the most emphatic manner the importance of increasing public expenditure on all branches of education, and the expediency of establishing technical schools and colleges. It repeated the same request in 1895. In 1896 when a famine had broken out in a more or less acute form throughout India, it again urged that "the true remedy against the recurrence of famine lies in the adoption of a policy which would enforce economy, husband the resources of the State, foster the development of indigenous and local arts and industries which have practically been extinguished, and help forward the introduction of modern arts and industries." In 1898 it again prayed, "that having regard to the poverty of the people, and the decline of indigenous industries, the Government will introduce a more elaborate and efficient scheme of technical instruction, and set apart more funds for a better and more successful working of the same." In 1904 the Congress urged the establishment of at least one central fully equipped polytechnic institute in the country, with minor technical schools and colleges in different provinces, and repeated that prayer in 1905. In 1906 it urged that primary education should be made free, and gradually compulsory, all over the country, and that adequate provision should be made for technical education in the different provinces, having regard to local requirements. It reiterated the same prayer in 1908, 1909, 1910, 1911 and 1913. After the outbreak of the war in 1914, the Congress urged the Government to adopt immediate measures to organise and develope Indian industries. As the years rolled on, the need for industrial development was more and more keenly felt by Indians. Since 1905, an Indian Industrial Conference has met year after year, as an adjunct of the National Congress, and it repeatedly pressed upon Government the need for providing technical, industrial and commercial education throughout the country. It has also urged various other measures for the encouragement of indigenous industries. But neither the recommendations of the Indian Famine Commission nor the representations of the Indian National Congress, nor those of the Indian Industrial Conference, produced much effect. Speaking at the Industrial Conference convened by Government in 1907, Sir John Hewett, the then Lieutenant-Governor of the United Provinces, said :—

"The question of technical and industrial education has been before the Government and the public for over twenty years. There is probably no subject on which more has been written or said, while less has been accomplished."

The earlier portion of Chapter X of our Report, dealing with industrial education, shows how little has been done up to this time to provide such education for the people. A few years ago the Government of India instituted scholarships of the annual value of £150, not exceeding ten in number, to enable Indians to proceed to Europe and America for special training, but it was not necessarily to be technical. Under this system 100 students have hitherto gone abroad for such training. Finding the provision to promote the scientific and industrial education of Indians in the country wholly insufficient, a few Indian and European gentlemen started an Association in Calcutta in 1904, one of the objects

of which was 'to enable distinguished graduates of Indian Universities to prosecute further studies in science in Europe, America,. Japan or other foreign countries.' Since 1910 the Bengal Government helped the Association with an annual grant of Rs. 5,000, which has been reduced to Rs. 2,500 since the war. Rai Jogendra Chandra Ghose Bahadur, Secretary of the Association, told us that over 300 students had been sent abroad with the assistance of this Association for such education, and that 140 of them had returned, of whom 130 were employed. He also told us that his students had started twenty new factories and were in charge of several factories employing a capital of over forty lakhs of rupees. This shows how keen is the desire of Indians to obtain technical education and to devote themselves to the industrial regeneration of their country. The Government of India have recently increased the number of technical scholarships to thirty, and have revised the rules regulating the grant of such scholarships, which are in some respects an improvement on those they have superseded. But these scholarships are too few to meet the requirements of the situation. Adequate provision for imparting useful industrial and technical education both at home and abroad, remains yet to be made for the youth of India.

Progress of other Nations in Manufactures, and its Effect on India.

Reference has been made in Chapters II, VI and VII of our Report to the growth of certain industries in India during recent years with Indian capital and Indian control, the most important among them being the cotton mill industry, the Tata Iron and Steel Works and the Tata Hydro-Electric Works. So far as this goes, this is a matter of sincere satisfaction. But the progress is altogether small. In the meantime, since 1870, other nations have made enormous progress in manufacturing industries. I would particularly mention Germany, Austria, the United States and Japan, as their progress has specially affected India. They have each done so by devising and carrying out a system of general and technical education for their peoples, accompanied by a system of State aid and encouragement of industries. And these nations—and several others besides—most of which have built up their industries by some form of State aid or protection, have taken full advantage of the policy of free trade to which India has been subjected, to purchase raw produce from India and to flood her markets with their manufactured goods. India has thus been exposed to ever-extending commercial subjugation by these nations, without being armed and equipped to offer a resistance and without being protected by any fiscal walls or ramparts. This incessant and long-continued attack has affected her agricultural as well as manufacturing industries. Her indigo industry has nearly been killed by Germany. Before 1897, when Dr. Bayer produced artificial indigo, Germany had been importing vegetable indigo of the value of over one million sterling. A few years afterwards she was exporting artificial indigo of three times that value. Germany's bounty-fed beet sugar gave the first serious shock to the ancient sugar industry of India, and it has suffered and is continually

suffering from the competition of foreign sugar. In 1913-14 Germany and Austria purchased from India raw materials amounting to £24,220,400 in value, or just a little less than one-sixth of the total output, while the imports to India from these two countries amounted to £11,304,141. The exports to the United Kingdom in the same year amounted to £38,236,780, and the imports from the United Kingdom to £78,388,149.

Forty or fifty years ago, Japan was far behind India both in agriculture and industries. But her Government and people, working in conjunction, have brought about a wonderful development of her industries built upon 'a system of technical education which included everything required to enable her to occupy her proper place among the manufacturing nations of the world.' Japan takes in a large proportion of the exports of our cotton, and she sends us an increasing quantity of her cotton goods and other manufactures. The average of her total imports of the five pre-war years 1909-10 to 1913-14 was 2·5 per cent. of our total imports. The share of her imports in the year ending March 1917, was 8·9 per cent. of the total. The total imports of India (excluding £28,959,766 of treasure, but including Government stores) amounted, in the year ending 31st March 1914, to £127,538,638. In the imports of the five pre-war years 1909-10 to 1913-14, the average share of the United Kingdom was 62·8 per cent.; of the other parts of the British Empire, 7 per cent.; of the allies (excluding Japan), 4·6 per cent.; of Japan, 2·5 per cent.; of the United States, 3·1 per cent.; of Java, 6·4 per cent.; and of the other foreign countries (principally Germany and Austria-Hungary), 13·6 per cent. The share of the principal countries in the imports of the year ending 31st March 1917, was the United Kingdom, 58·7 per cent.; other parts of the British Empire, 7 per cent.; allies (excluding Japan), 3·3 per cent.; Japan, 8·9 per cent.; the United States, 7·3 per cent.; Java, 8·9 per cent.; and other foreign countries, 5·9 per cent.

The extent to which India has thus come to be dependent upon other countries for the raw materials and manufactured articles necessary in the daily life of a modern civilised community is deplorable. The following classified table of the imports which came into India in the year ending March 1914, will give an idea of the extent of this dependence :—

	£
I.—Food, drink, and tobacco	16,441,330
Fish (excluding canned fish)	208,330
Fruits and vegetables	753,583
Grain, pulse and flour	185,560
Liquors	1,251,642
Provisions and oilman's stores	1,649,087
Spices	1,154,875
Sugar	9,971,251
Tea	152,409
Other food and drink, *i.e.*, coffee (other than roasted or ground) hops, etc.	511,623
Tobacco	501,923

	£
II.—Raw materials and produce, and articles mainly unmanufactured	7,038,380
Coal, coke, and patent fuel	710,920
Gums, resins, and ice	175,764
Hides and skins, raw	101,066
Metallic ores and scrap iron or steel for manufacture	41,977
Oils	2,934,611
Seeds, including oil seeds	53,431
Tallow, stearine, wax	150,638
Textile materials	1,204,510
Wood and timber	515,590
Miscellaneous (including shells, chank, cowries, fish manure, pulp of wood and rags for paper)	1,149,873
III.—Articles wholly or mainly manufactured	96,769,443
Apparel	1,669,389
Arms, ammunition and military stores	236,713
Carriages and cars, including cycles and motor cars	1,422,667
Chemicals, drugs and medicines	1,605,699
Cutlery, hardware, implements (except machine tools) and instruments	4,291,140
Dyes and colours	1,510,933
Furniture, cabinet-ware, and manufactures of wood	224,323
Glassware and earthenware	1,728,667
Hides and skins, tanned or dressed, and leather	266,683
Machinery of all kinds (including belting for machinery)	5,508,397
Metals, iron and steel and manufactures thereof	10,633,249
Metals, other than iron and steel and manufactures thereof	41,010,801
Paper, paste board, and stationery	1,524,982
Railway plant and rolling stock	6,689,794
Yarn and textile fabrics	50,360,043
Miscellaneous (including prints, engravings, pictures, rubber manufactures, smokers' requisites, soaps, spirits perfumed, sticks and whips, stones and marble, toilet requisites, toys, and requisites for games and sports, umbrellas and umbrella fittings)	5,055,963
IV.—Miscellaneous and unclassified, including living animals, fodder, bran pollards and articles imported by post	1,916,135
V.—Government stores	5,373,350
Total value of all imports, excluding treasure	£127,538,638

Chapter IV of our Report gives a more analysed and critical summary of the industrial deficiencies of India. It similarly points out that the list of industries which, though the materials and articles we import are essential alike in peace and war, are lacking in this country is lengthy and ominous; and that until they are brought into existence on an adequate scale, Indian capitalists will, in times of peace, be deprived

of a number of profitable enterprises, whilst, as experience has shown in the event of a war which renders sea transport impossible, India's all-important existing industries will be exposed to the risk of stoppage, her consumers to great hardship, and her armed forces to the gravest possible danger. With the abundance of our raw materials, agricultural and mineral, with the great natural facilities for power and transport, with a vast home market to absorb all that we may manufacture, it should not be difficult to effectively cut down this list, if the Government will equip the people for the task by providing the necessary educational and banking facilities and extending to them the patronage and support of the State. How the Government may best do this is the question we have to answer.

Government Industrial Policy in Recent Years.

I have little to add to the history of Government industrial policy in recent years which is given in Chapter VIII of the Report. The account given there of the efforts made by Government for the improvement of Indian industries shows how little has been achieved. But I do not agree with my colleagues when they say (paragraph 111) that this has been "owing to the lack of a definite and accepted policy, and to the absence of an appropriate organisation of specialised experts." I share with them the regret that Lord Morley did not approve that part of the proposal of the Madras Government made in 1910, which urged that Government agency should be employed to demonstrate that certain industrial improvements could be adopted with commercial advantage; and I am thankful that in modification of that order, Lord Crewe, by his telegram, dated the 1st February, 1916, authorised the Government of India, pending final orders on this Commission's Report, "to instruct Local Governments that in cases in which they desire to help particular industries they may do so, subject to your approval and to financial exigencies, without being unduly restricted by my predecessor's rulings." But I cannot endorse that part of the Report which speaks of "the deadening effect produced by Lord Morley's dictum of 1910 on the initial attempts made by Government for the improvement of industries." (Introductory, page xix.) I think my colleagues have taken an exaggerated view of the effect of Lord Morley's refusal to sanction the particular part of the Madras Government's proposal to which reference has been made above. In justice to Lord Morley, and in order that the orders which he passed on the subject of technical education may be properly appreciated, I will quote below the following two paragraphs from the despatch in question, dated the 29th July 1910. Said his Lordship:—

"I have examined the account which the Madras Government have given of the attempts to create new industries in the province. The results represent considerable labour and ingenuity, but they are not of a character to remove my doubts as to the utility of State effort in this direction, unless it is strictly limited to industrial instruction and avoids the semblance of a commercial venture. So limited, interference with private enterprise is avoided, while there still remains an ample and well-defined sphere of activity. The limit disregarded, there is the danger that the new State industry will either remain a petty and ineffective plaything, or will become a costly and

hazardous speculation. I sympathise with the Conference and the Madras Government in their anxiety for the industrial development of the province, but I think that it is more likely to be retarded than promoted by the diversion to State-managed commercial enterprises of funds which are urgently required for the extension of industrial and technical instruction.

"The policy which I am prepared to sanction is that State funds may be expended upon familiarising the people with such improvements in the methods of production as modern science and the practice of European countries can suggest; further than this the State should not go, and it must be left to private enterprise to demonstrate that these improvements can be adopted with commercial advantage. Within the limits here indicated it appears to me that the objects which the Industrial Conference had in view can all be accomplished by means of technical and industrial schools; it is in such schools that a knowledge of new industries and new processes can be imparted, that the use of new implements can best be taught and the technical skill of the artisans most readily improved. In a leather school the method of chrome tanning can be demonstrated and taught; in a weaving school the indigenous hand loom can be improved and the advantage of the improvement demonstrated. If the schools are properly managed they will supply the private capitalist with instructed workmen and with all the information he requires for a commercial venture. To convert the leather or weaving school into a Government factory in order to demonstrate that articles can be manufactured and sold to the public at a profit, goes, in my view, beyond what is desirable and beyond what is found necessary in other provinces. My objections do not extend to the establishment of a bureau of industrial information, or to the dissemination from such a centre of intelligence and advice regarding new industries, processes or appliances, provided that nothing is done calculated to interfere with private enterprise."

As Lord Crewe pointed out in his despatch No. 24-Revenue, dated March 12th, 1912:—

"The Government of Madras seemed to have placed too limited a construction upon the orders given in my predecessor's despatch of 29th July, 1910. The policy which he then sanctioned was that State funds might be expended upon familiarising the people with such methods of production as modern science and the practice of European countries could suggest. This need not be interpreted as confining instruction solely to industrial schools. I am prepared to recognise that in certain cases instruction in industrial schools may be insufficient and may require to be supplemented by practical training in workshops, where the application of new processes may be demonstrated; and there is no objection to the purchase and maintenance of experimental plant for the purpose of demonstrating the advantage of improved machinery or new processes and for ascertaining the data of production."

Indian public opinion no doubt desired that the Government should go farther than Lord Morley had sanctioned. But even so, they would have been grateful if action had been taken within the "ample and well-defined sphere of activity" which he had sanctioned; if the funds which it was proposed to divert to State-managed commercial enterprises, had been devoted to "the extension of industrial and technical instruction" for which his Lordship said, they were "urgently required"; if State funds had been "expended upon familiarising the people with such improvements in the methods of production as modern science and the practice of European countries could suggest." Their complaint was that that was not done. It is said in paragraph 199 of the Report that the Government (of India) "had neither the organisation nor the equipment to give effect even to the comparatively limited policy sanctioned by Lord Morley." The obvious answer is that the necessary organisation and equipment should have been created.

A Welcome Change.

The outbreak of the war drew forcible attention to the extent of India's dependence upon countries outside the British Empire, parti-

cularly upon Germany and Austria, for the supply of many of the necessaries of life for her people, and some time after the commencement of the war, the Government of India resolved to examine the question of the industrial policy which the Government should pursue in the altered state of things in India. In their despatch to the Secretary of State dated the 26th November 1915, Lord Hardinge's Government put the case for a change of policy in very clear and forceful language. They said :—

"It is becoming increasingly clear that a definite and self-conscious policy of improving the industrial capabilities of India will have to be pursued after the war, unless she is to become more and more a dumping ground for the manufactures of foreign nations who will be competing the more keenly for markets, the more it becomes apparent that the political future of the larger nations depends on their economic position. The attitude of the Indian public towards this important question is unanimous and cannot be left out of account. Manufacturers, politicians and the literate public have for long been pressing their demands for a definite and accepted policy of State aid to Indian industries : and the demand is one which evokes the sympathy of all classes of Indians whose position or intelligence leads them to take any degree of interest in such matters." The despatch emphasised "the need for an industrial policy which will enable technical education in India to produce its best results, and which will lighten the pressure on purely literary courses and reduce the excessive demand for employment in the services and callings to which these courses lead up."

Finally the Government said :—

"After the war India will consider herself entitled to demand the utmost help which her Government can afford to enable her to take her place, so far as circumstances permit, as a manufacturing country."

The acceptance of this policy by the Secretary of State for India and the appointment of this Commission to consider and report in what ways this help may be given was welcomed by Indians with feelings of gratitude and hope, like the dawn of day after a dark and dreary night. But the hope is occasionally clouded by a recollection of the fact that the Labour Party joining with the Irish Nationalists and the Lancashire vote mobilised its force against the Government in England against the raising of the import duty on cotton goods in India—even while the Indian cotton excise duty which India has regarded as a great and crying grievance all these twenty-one years, was still allowed to continue—and that so highly honoured a statesman as Mr. Asquith gave his support to the Government policy only on the understanding that this in common with all other fiscal issues would be reconsidered at the end of the war. Indians remember, however, with gratitude the firm attitude which Mr. Austen Chamberlain, the then Secretary of State for India, adopted in the matter, and the reply which he gave to the Lancashire deputation that waited on him with reference to that simple fiscal measure, without which, as he told the deputation, it would have been impossible for India to make the contribution of £100 millions to the cost of the war.

The brief narrative which I have given here of the industrial relations of India with England, and of the policy which England has pursued towards India, will, I hope, lead some of those of my English fellow-subjects, who are unwilling to let the Government of India protect and promote Indian industries under a wrong apprehension that that

would injure English interests, to recall to mind how much India has contributed to the prosperity of England dur. g a century and a half, and how much she has suffered by reason of the illiberal policy which has hitherto been pursued towards her. It will lead them, I hope, to reflect that the result of this policy is that, after a hundred and fifty years of British Rule, India, with all her vast natural resources and requirements, is the poorest country in the world, and that comparing her pitiable condition with the prosperous state of the self-governing Dominions which have enjoyed freedom to develope their industries, they will recognise the necessity and the justice of allowing India liberty to regain national health and prosperity. Such a policy will not benefit India alone. It will benefit England also. For if India will grow rich, if the standard of living in India will rise, her vast population will naturally absorb a great deal more of imports than it does at present. This view was repeatedly urged by Mr. Dadabhai Naoroji, and it is fully supported by the history of other countries which have become prosperous during recent times. The United States offer an illustration. The following figures show how their imports have grown with their prosperity :—

Year.	Imports in millions of dollars.
1860	353
1870	435
1880	667
1890	789
1900	849

The same truth is illustrated by the history of the commerce of Japan. As Japan has been developing her own manufactures and growing in affluence, she has been furnishing a rapidly growing market to the merchants of the world. The following table makes this clear :—

ANNUAL AVERAGE IMPORTS OF JAPAN IN RECENT DECADES.

Values in Millions of Yen.

—	From the United Kingdom.	From Germany.	From U. S. A.	From other Countries.	From all Countries.
1881-1890	19·6	3·4	4·2	19·3	46·5
1891-1900	46·6	14 8	22·8	87·0	171·2
1900-1909	84·3	36·1	65·8	199·8	386·0

Commenting on the growth and variety of imported manufactures in the United States noted above, Mr. Clive Day says in "History of Commerce" (page 568) :—

"It is probable that the United States will always continue to import manufactured wares like those named above, in great variety and amounting in the total to

considerable value. We cannot afford to refuse the contributions of peoples who have specialized in various lines, and by reason of inherited taste and skill, or with the aid of exceptional natural resources, can offer us what we cannot readily produce ourselves."

This is exactly what I would say with regard to our future, assuming that we are allowed to develop our home industries to the fullest extent we can. But I need not labour this point further. I am glad to find that "the Committee on Commercial and Industrial Policy after the War" of which Lord Balfour of Burleigh was the Chairman, has expressed the same view. In paragraphs 232 and 233 of their Final Report they say :—

"Whilst Europe as a whole may be said to be divided into settled fields of international competition where local circumstances, convenience of transport, and suitability of production for local needs, have become the controlling factors, there remain vast markets still practically untouched for the future development of the exporting nations of the world. China, with its 400 millions of population, an old and industrious civilisation, must in the near future develop its already great and growing demands for products of our trades. There are great potentialities in India and there is also the demand of Siberia and the smaller Far Eastern countries, which are likely in future to afford profitable markets.

"It is true that in this sphere the competition of Japan will have to be increasingly reckoned with, but we have no doubt that with a rise in the standard of living of Eastern peoples, there will come a corresponding increase of the quantity and improvement of the quality of the goods demanded. This development cannot fail to be of advantage to British industry, and for this reason, if for no other, we desire to emphasise the importance of all measures, including particularly the rapid extension of Railways, likely to promote the economic well-being of India."

The hope of Indians for the industrial development of their country has been further strengthened by the knowledge that, like their noble predecessors in office, the present Viceroy and the Secretary of State are also convinced of the necessity of a liberal policy being adopted in respect of Indian industrial development. They have read the following passage in the Report on Constitutional Reforms with great satisfaction :—

"On all grounds, a forward policy in industrial development is urgently called for, not merely to give India economic stability; but in order to satisfy the aspirations of her people who desire to see her stand before the world as a well-poised, up-to-date country; in order to provide an outlet for the energies of her young men who are otherwise drawn exclusively to Government service or a few overstocked professions; in order that money now lying unproductive may be applied to the benefit of the whole community; and in order that the too speculative and literary tendencies of Indian thought may be bent to more practical ends, and the people may be better qualified to shoulder the new responsibilities which the new constitution will lay upon them. These considerations led Lord Hardinge's Government to recommend the appointment of the Industrial Commission which is at present sitting.

"These are political considerations peculiar to India itself. But both on economic and military grounds imperial interests also demand that the natural resources of India should henceforth be better utilised. We cannot measure the access of strength which an industrialised India will bring to the power of the Empire; but we are sure that it will be welcome after the war."

How far the hope so raised will be realised, will depend largely upon the decision of the vital question whether the power as well as the responsibility of promoting the industrial development of India, shall be placed in the Government of India, acting under the control of the elected representatives of the people in the Legislative Council. This factor governs all our recommendations.

Industries and Agriculture.

In Chapter V of the Report dealing with industries and agriculture my colleagues say :—

"We take this opportunity of stating in the most emphatic manner our opinion of the paramount importance of agriculture to this country, and of the necessity of doing everything possible to improve its methods and increase its output."

They go on to say :—

"Such improvement will, we anticipate, be mainly effected by the organisations which are in process of development under the charge of the imperial and provincial Departments of Agriculture, and though the results attained are not yet of much economic importance, they are steadily growing and will eventually demand large manufacturing establishments to produce the machinery, plants and tools which the raiyats will find advantageous as labour-saving devices."

They point out the possibilities of improved agricultural methods and suggest that there is much scope for the use of power-driven machinery in agriculture for lifting water from wells, channels, tanks and rivers, for irrigation and for other purposes, and for improving the land by draining low-lying ground and by deep ploughing, etc. They also recommend the provision of hand machinery of improved types, especially for the reaping, threshing and winnowing of crops. They go on to say :—

"India is not at all yet accustomed to the free use of mechanical appliances, and it should be an important function of the Departments of Industries and Agriculture to encourage their introduction in every possible way. For a long time to come the employment of machinery in agriculture in India will largely depend upon the completeness and efficiency of the official organisation which is created to encourage its use and to assist those who use it."

In this connection I would draw attention to the opinion of Mr. James MacKenna, the Agricultural Adviser to the Government of India. At page 29 of his valuable pamphlet on "Agriculture in India," published in 1915, he says :—

"We have seen that the introduction of European machinery has always figured prominently in the efforts of the amateur agricultural reformer. Much success has, undoubtedly, been obtained in the introduction of grain-winnowers, cane-crushing machinery, etc. But in recommending the introduction of reaping machines or heavy English ploughs, caution is necessary. Reaping machines may be useful on large estates where labour is scarce, but the whole rural economy of a tract where population is dense may be upset by their use. A large amount of cheap labour which ordinarily does the reaping is thrown out of employment; the gleaners lose their recognised perquisites. In the case of heavy ploughs, the advisability of deep ploughing has first to be proved. In both cases the capacity of the available cattle and the difficulty of replacing broken spare parts and of carrying out repairs are serious obstacles to the introduction of foreign machinery. As in the case of plants, the improvement of the local material which the cultivator can himself make and repair and which his cattle can draw, seems the more hopeful line of improvement."

I entirely endorse this opinion. The difficulties pointed out by Mr. MacKenna apply with equal, if not greater, force, in the case of power-driven machinery for the purposes indicated above. As my colleagues have observed "in India agricultural conditions are widely different from those in Europe and Germany," and "as yet very little of mechanically operated plant has come into use" here, "chiefly because holdings are small and scattered, and ryots possess little or no capital." "The

results achieved in this direction in the south of India" are also "not very important perhaps, if measured by their immediate economic effect."[2] While, therefore, I appreciate the value of the use of power-driven machinery in the development of agriculture, when economic conditions should favour its introduction, I do not agree with the recommendation "that it should be an important function of the Departments of Industries and Agriculture to encourage their introduction in *every possible way*." I apprehend that with such a recommendation from the Commission, the zeal for promoting mechanical engineering interests and establishments may push the use of power-driven machinery without due appreciation of the economic interests of agriculturists in the present circumstances of the country. For these reasons, and because in any case the introduction of power-driven machinery will take a long time, I think it my duty to draw attention to other means of improvement, particularly to agricultural education.

The history of agriculture in India during British rule has recently been told by Mr. MacKenna in his pamphlet referred to above. Agriculture is by far the greatest of the industries of India, and nearly 200 millions of its immense population are dependent for their livelihood on agriculture or on industries subsidiary to it. The Famine Commission of 1880 made very strong recommendations as to the necessity of establishing departments under a Director in each province to promote agricultural enquiry, agricultural improvement and famine relief. The departments were constituted, but by a Resolution published in 1881 the Government of India decided to postpone agricultural improvement until the scheme of agricultural enquiry had been completed. Nothing was done till 1889, at the end of which year the Secretary of State sent out Dr. Voelcker of the Royal Agricultural Society to enquire into and advise upon the improvement of Indian agriculture. After touring over India and holding many conferences, Dr. Voelcker recommended a systematic prosecution of agricultural enquiry and the spread of general and agricultural education, and laid down in considerable detail the lines on which agricultural improvement was possible. An Agricultural Chemist and an Assistant Chemist were appointed in 1892 to carry on research and to dispose of chemical questions connected with forest and agriculture. In 1901 an Inspector-General of Agriculture was appointed. Two other scientists were added to the staff in 1903. Mr. MacKenna says :—

> "The object aimed at was to increase the revenues of India by the improvement of agriculture ; but nothing was done for that improvement, and the expansion of the Land Records staff and the compilation of statistics almost entirely occupied the attention of the Provincial Departments.

An Agricultural Research Institute was established at Pusa in 1905 with the help of a generous donation of £30,000 made to the Viceroy by Mr. Henry Phipps of Chicago. In 1905-06 the Government of India announced that a sum of 20 lakhs (subsequently raised to 24 lakhs) would annually be available for the improvement of agriculture. Agricultural colleges were accordingly re-organised or started at Poona,

Cawnpore, Sabour, Nagpur, Lyallpur and Coimbatore. These colleges have been doing good work, but very little progress has been made with the agricultural education of the people. I wish to acknowledge here the improvement which has been brought about in agriculture by means of our large irrigation works, which the Government have constructed, the improvement of wheat and cotton and in other ways. That improvement has been great and the Government is entitled to full credit for it. But I wish to draw attention to the urgent need and great possibilities of further improvement. Irrigation requires to be much more extended. A more systematic and extended programme of improvement requires to be adopted, the most important item in which should be agricultural education.

Agricultural Education.

Writing in 1915 on this subject Mr. MacKenna said :—

"There is probably no subject connected with agriculture on which so much has been written as agricultural education ; none, perhaps in which less has been effected. It is a constant anxiety to agricultural workers who mainly strive after an ideal which seems untenable. It has been debated at numerous conferences and has been the text of many writers, but there are practically no results to show." "The Famine Commissioners, so long ago as 1880, expressed the view *that no general advance in the agricultural system can be expected until the rural population had been so educated as to enable them to take a practical interest in agricultural progress and reform*. These views were confirmed by the Agricultural Conference of 1888 . . . The most important, and probably, the soundest proposition laid down by the conference was that it *was most desirable to extend primary education amongst agricultural classes*. But with the enunciation of this basic principle other resolutions were passed which, while containing much that was excellent, probably led to the extraordinary confusion of subsequent years." For some time "the dominating idea was that it was necessary *to teach agriculture* somehow or other, in rural schools. Fortunately this idea has now been abandoned. It is now agreed that agriculture, as such, cannot be taught in schools ; that rural education must be general and agricultural education technical" . . . . "The view now taken is that, instead of endeavouring to teach agriculture as such an attempt should be made to impart to the general scheme of education a markedly agricultural colour and to encourage powers of observation and the study of nature with special reference to the surroundings of each school. With this object text books are being re-written so as to include lessons on familiar objects ; nature study is being taught and school gardens have been started. There are, however, serious difficulties in obtaining suitable teachers. But, as I have already said, more will depend on the natural awakening of the intelligence of pupils by the spread of general education than on specialised training. And in primary schools the essential thing is to establish general education on a firm basis so that the pupils may develop powers of observation and of reasoning. If this be done interest in their surroundings will naturally follow."

Mr. MacKenna says in the end :—

"Any attempt to teach agriculture in India, before investigation has provided the material, is a fundamental mistake which has seriously retarded development, and this mistake has affected, not only elementary, but to a much greater extent collegiate education."

This is where we stood after thirty-five years of inquiry, discussion and trial!

Other civilised countries took a much shorter period to decide upon a definite course of agricultural education and have prospered on their decision. In Sir Horace Plunkett's Report of the Recess Committee of 1896 an account is given of the systems of State aid to agriculture and industry which were prevalent before that year in various countries of Europe. Though these countries, as also America and

Japan, have made much greater progress since then both in agricultural education and improvement, that report is still of great value to us and will amply repay perusal. I will extract only one passage from it here. Said Sir Horace Plunkett and his colleagues:—

"The most positive action of the State in assisting agriculture is taken in connection with education. Everywhere it is accepted as an axiom that technical knowledge and general enlightenment of the agricultural class are the most valuable of all levers of progress. The great sums spent by the various countries in promoting technical education as applied to agriculture, as well as to other industries, prove this. M. Marey-Oyens, the head of the Dutch Board of Commerce and Industry, and President of the Agricultural Council, says:—'Every guilder spent in the promotion of agricultural teaching brings back profit a hundredfold.' 'Every franc spent in agricultural teaching brings a brilliant return,' says the Belgian Minister of Agriculture in his message to Parliament last year. M. Tisserand attributes the great progress made by French agriculture since 1870, in a large measure "to our schools, our professors, our experiment stations, and the illustrious men of science, whom the administration has induced to devote themselves to the study of agricultural questions." Mr. M. H. Jenkins, in his Report to the Royal Commission on Technical Instruction, says, 'the results of agricultural education in Denmark have been something extraordinary. Danish butter is now the best in the world; in 1880 it was described by the British Vice-Consul at Copenhagen as "execrably bad"; the progress since is directly traceable to agricultural education.' "—(Report, pages 54-55).

It is hardly necessary to refer at any length to the great progress of agricultural education and improvement in America or to the enormous wealth and prosperity which has resulted therefrom. But I might refer here to the case of Japan. We know that Japan has made remarkable progress in agriculture. She developed an excellent system of agricultural education many years ago. In the valuable "Note on Agriculture in Japan" which Sir Frederick Nicholson submitted to the Commission along with his written evidence, he describes the system of agricultural education which he found at work in Japan in 1907. It is not necessary for me to describe the system here. My object simply is to draw attention to the necessity, in the interests of the improvement of agriculture and agriculturists, of early steps being taken to devise a system of both general and agricultural education for the masses of our agricultural population.

I would also recommend that the attention of the Agricultural Department be invited to the desirability of carrying out those other recommendations of Dr. Voelcker which have not yet been carried out, particularly those relating to the "establishment wherever possible of Fuel and Fodder Reserves." Our attention was particularly drawn to the fact that the high prices of fuel and fodder are inflicting serious hardship and loss upon the people in general and of agriculturists in particular. I may note that we were informed that last year about 40,000 acres of irrigated plantation were established by the Forest Department in the Punjab, in order to meet provincial requirements.

The high prices of foodstuffs and the consequent suffering to which the bulk of the people are exposed have made the question of increasing the yield of our food crops also one of great and pressing importance. In his pamphlet on the "Agricultural Problems of India," which Rai Gangaram Bahadur submitted to the Commission, he argues that "we are producing in a normal year, just enough to meet our requirements

(of food consumption) with no surplus to meet the contingency of a failure of the rains in the ensuing year." We are also confronted with the fact that in India the yield per acre of crops is very much lower than what it is in other countries. The figures given by Rai Gangaram Bahadur at page 12 and in Table VIII of his book are instructive. The average yield per acre of wheat in Bombay and the United Provinces was 1,250 lbs.; in the United Kingdom, it was 1,973 lbs.; in Belgium, 2,174 lbs.; in Denmark, 2,526 lbs.; in Switzerland, 1,858 lbs. The average yield per acre of barley in the United Provinces was 1,300 lbs.; in the United Kingdom, 2,105 lbs.; in Belgium, 2,953 lbs.; in Denmark, 2,456 lbs.; in Switzerland 1,940 lbs. The average yield per acre of maize in the North West Frontier was 1,356 lbs.; in Canada, 3,487 lbs.; in New Zealand, 3,191 lbs.; in Switzerland, 2,198 lbs. The average yield per acre of rice in India is only half of what it is in Japan. The possibilities of development that lie before us are therefore vast, and the call for measures for improvement is urgent and insistent. It is the call both of India and of the Empire, and I strongly recommend that the matter should receive prompt and adequate attention from the Agricultural Departments—both Imperial and Provincial.

In this connection I desire also to draw attention to the necessity of providing greater financial facilities for agricultural improvement. So long ago as 1882, that revered friend of India, Sir William Wedderburn, advocated the establishment of agricultural banks for this purpose. The Indian National Congress pressed the suggestion upon the attention of Government. But it has not yet been carried out. I would draw attention to the very valuable paper on "The Re-organization of Rural Credit in India," which was read by Mr. Ranade before the first Industrial Conference at Poona in 1891.—(Ranade's *Essays*, pages 41-64.) It is a powerful plea for the establishment of agricultural banks. I might add that, besides other countries mentioned by Mr. Ranade, Japan has provided such facilities as are here recommended for the improvement of its agriculture. The Japan Year Book for 1917 says:—

"There are two kinds of agricultural credit. They are long credit and short credit, the former for the purchase of farm land and for the development of farm land and other permanent improvements for which a loan for a term of 50 years or less is allowed. The short-term credit is one that is to be used mostly for the purchase of fertilizers, farm implements, or food for cattle. Our banks usually give credit for a term of five years or less. There are also credit associations for supplementing these agricultural banks."

Technical Education.

The modern system of technical education may be said to date from the famous Universal Exhibition held in London in the year 1851. Speaking generally Englishmen did not believe in the value of technical education, and much effort has been necessary in England itself to make them do so. One of the earliest of these efforts was made by Mr. J. Scott Russell, who published a valuable book in 1869, named "Systematic Technical Education for the English People." In this

book, after showing that education should be both general and special, he said :—

"The highest value in the world's markets will be obtained by that nation which has been at most pains to cultivate the intelligence of its people generally, and afterwards to give each the highest education and training in this special calling. In other words, the value of the nation's work will vary with the excellence of the national system of technical education. All I have said above seems axiomatic. To me it is so, but I trust the reader will not be offended if I am obliged to treat it quite otherwise. The English people do not believe in the value of technical education. Still less do they believe in the value of a national system of education, and still less in the duty of the Government, the legislature, and the educated part of a community, to undertake the education of a whole people. I am therefore compelled to prove as mere matters of facts that which the accomplished scholar, or observant traveller, takes as an axiom on which argument is wasted. It is the object of this chapter to prove that technical education has brought good of a national and commercial kind to those who possess it ; that the want of it is attended with pecuniary loss, and that there is social danger to the community in our continued neglect of it.

"Of late years a series of great public events have been taking place, which have been of great national value in serving to awaken the British people—For half a century they had been enjoying the fruits of the inventions of a few men of genius who had created the whole system of modern manufacturing, and Providence had also endowed them with the accumulated wealth of countless centuries stored up in the bowels of the earth in the shape of coal and iron, ready to be used or wasted and worked out in this manufacturing century. The genius of a few men having set coal and iron to do the manufacturing work of mind and man, the citizens of England had begun to think that it was they who were superior in intelligence and civilization to the un-coaled, un-ironed, un-engineered nations around them. For half a century nothing occurred to awaken them from this dream, and for that half century the works of English engineers and English iron and coal bore the highest reputation, and earned the highest prices in the world.

"Eighteen years ago there began a series of competitive trials of intelligence and skill between the citizens of the different civilized nations of the world. The scene of the first trial was in London in 1851. It was the famous Universal Exhibition of the Industries and Products of all nations. *In that great school the civilized nations of Europe had their first lesson in technical education.* They were able to see in how many things England retained her hereditary excellence and England was able to see in how many branches of taste and skill other nations possessed qualities in which she was wanting." —(*Systematic Technical Education for the English People*, by J. Scott Russell, London, Bradbury, Evans & Co., 11 Bouverie Street, 1869, pages 79-81.)

Mr. Russell went on to say that up to 1851, and for many years after, England held supremacy in the great objects of manufacturing and constructive skill. But she lagged behind other nations in some other arts. For instance :—

"The Exhibition of 1851 had disgusted the whole nation with its blue earthenware plates, cups and saucers, borrowed from the 2,000 years' tradition of China, and with its huge lumps of glass, called decanters and glasses, cut or moulded into hideous distortions of form . . . All England was struck by the amazing superiority of some continental nations in the beauty and grace of design, which sufficed to convert the rude and nearly worthless material of clay and flint into valuable and invaluable works of art, in earthenware and glass. She occupied the four years' interval between the Exhibitions of 1851 and 1855 in collecting and diffusing through the manufacturing countries the best models of the best masters, in establishing for the potteries and glass works schools of design, and in training teachers for art workmen. These young institutions already bore fruit in 1855, and (when the second Exhibition took place in Paris in 1855) England was no longer outstripped in pottery and glass."

On the other hand, the Exhibition of 1851 made the French and German nations fully realise their inferiority to England in the manufactures of iron and steel, the great instruments of skill, industry, mechanical power, and transport. When the Exhibition of 1855 took place, it was found that they had already recorded much advance in

the manufacture of iron, steel and other metal. "*They had already established schools in every metropolis, large town, or centre of industry, for educating professional men and masters, for training foremen and skilled workmen, and for educating apprentices.*"

The fourth Exhibition took place in Paris in 1867. It gave the nations, and especially England, a final lesson.

"By that Exhibition," says Mr. Scott Russell, "we were rudely awakened and thoroughly alarmed. We then learnt, not that we were equalled, but that we were beaten—not on some points, but by some nation or other on nearly all those points on which we had prided ourselves. . . . England was convinced that she had been asleep, and that a whole generation of wakeful, skilled workmen had been trained in other countries during the interval between 1851 and 1867."—(*Ibid*, page 86.)

The jurors who had been appointed at the Paris Exhibition and the Government reporters made their report. On this report the Government sent abroad a Commissioner to ascertain whether the alleged defects of the English system of education, and the inferiority of the English to some other people in some sort of technical skill, were real or imaginary. Mr. Samuelson, M.P., travelled in France, Belgium and Germany, examining as he went the most famous establishments on the Continent which stood in direct rivalry to England. "He found," said Mr. Russell, "everywhere in these establishments men of all ranks better educated than our own; working men less illiterate—foremen and managers well-educated, and masters accomplished, well-informed, technical men." He summed up the result of his examination as follows :—

"I do not think it possible to estimate precisely what has been the influence of continental education on continental manufactures . . . That the rapid progress of many trades abroad has been greatly facilitated by the superior technical knowledge of the directors of works everywhere, and by the comparatively advanced elementary instruction of the workers in some departments of industry, can admit of but little doubt . . . Meanwhile we know that our manufacturing artisans are imperfectly taught, our agricultural labourers illiterate; neither one nor the other can put forth with effect the splendid qualities with which Providence has endowed our people. Our foremen, chosen from the lower industrial ranks, have no sufficient opportunities of correcting the deficiencies of their early education; our managers are too apt, in every case of novelty, to proceed by trial and error, without scientific principles to guide them; and the sons of our great manufacturers too often either despise the pursuits of their fathers, as mere handicrafts unworthy of men of wealth and education, or else, overlooking the beautiful examples which they afford of the application of natural laws to the wants of men, follow them solely as a means of heaping up more wealth, or at the best for want of other occupation: to the evils of such a condition not only our statesmen, but also our people, are rapidly awakening, and the disease being once acknowledged, I believe the remedy will soon be applied."

The following statement of one of the jurors consulted by the Commissioner expressed the general sense of those who had been examined. Said Mr. Mundella :—

"I am of opinion that English workman is gradually losing the race, through the superior intelligence which foreign Governments are carefully developing in their artisans....The education of Germany is the result of a national organisation, which compels every peasant to send his children to school, and afterwards affords the opportunity of acquiring such technical knowledge as may be useful in the department of industry to which they were destined....If we are to maintain our position in industrial competition, we must oppose to this national organisation one equally effective and complete; if we continue the fight with our present voluntary system, we shall be defeated;

generations hence we shall be struggling with ignorance, squalor, pauperism and crime; *but with a system of national education made compulsory, and supplemented with art and industrial education, I believe within twenty years England would possess the most intelligent and inventive artisans in the world.*"—(Pages 97-98.)

(The italics throughout are mine.)

The people and Parliament of England recognised the soundness of this opinion. The Elementary Education Act was passed in 1870, an expenditure of many millions a year was agreed upon, and elementary education made compulsory. The provision for supplementing this education with industrial and technical education was slower to come, but come it did. England has made a great deal of provision since then for imparting technical and scientific education in her schools, colleges and universities. The number of these latter has been raised from 1860 from nine to eighteen. It is this which has enabled England to maintain her high position and to keep up her industrial eminence. It is this which has enabled her to fight the splendid fight she has fought in this war. For, though every lover of liberty must rejoice at the invaluable help which the United States of America are now giving to the cause of freedom, it is but bare justice to say that, unprepared though England was before the war, it is British brains and British technical skill, united no doubt with French brains and French technical skill, and supported by British and French hearts of steel, that have enabled Britain and France to baffle Germany, and made it possible for the Allies to achieve a final victory. And yet as the reports of the various departmental committees of 'the Committee on Commercial and Industrial Policy after the War' show, the wisdom and experience of England is loudly calling for "widespread and far-reaching changes in respect of primary and secondary education and apprenticeship," and for 'better technical and art education' for her people in order that her industrial position after the war may be quite secure.

I have referred at length to the history of the progress of education, both general and technical, in England, as it has a great lesson and an inspiration for us. Our education to-day is in many respects nearly in as bad a condition as was England's in 1869; and, in my opinion, the course which was then suggested by Mr. Mundella and Mr. Samuelson in the passages I have quoted above, is the exact course which should be adopted here. It was the misfortune of India that when our English fellow-subjects, who have taken upon themselves the responsibility for the welfare of the people of India, were convinced of the need of universal elementary education in England, they did not introduce it at the same time in India also. If this had been done, India would not have stood so far behind other nations as she does to-day. However the neglect of the past should be made up, as much as possible, by the adoption of prompt and effective measures now. The need for such measures has become greater by the great changes which have taken place during the interval. The commercial war which has long been going on will become much keener after the war. India will be much more exposed to the competition of nations which have built up their industries upon a wide-

spread and comprehensive system of technical education. In this category come not only the nations of Europe and America, but also Japan. As the Government of India deputed a special officer to Japan to obtain information for us, so that "we may know exactly what her Government has done to aid her people in the notable advance which they have made," I invise particular attention to the progress of education in that country.

It is clearly established that the development of Japanese industries has been built upon "a system of technical education which included everything required to enable her to occupy her proper place among the manufacturing nations of the world." If the industries of India are to develop, and Indians to have a fair chance in the competition to which they are exposed, it is essential that a system of education at least as good as that of Japan should be introduced in India. I am at one with my colleagues in urging the fundamental necessity of providing primary education for the artisan and labouring population. No system of industrial and technical education can be reared except upon that basis. But the artisan and labouring population do not stand apart from the rest of the community; and therefore if this *sine qua non* of industrial efficiency and economic progress is to be established, it is necessary that primary education should be made universal. I agree also in urging that drawing and manual training should be introduced into primary schools as soon as possible. In my opinion until primary education is made universal, if not compulsory, and until drawing made a compulsory subject in all primary schools, the foundation of a satisfactory system of industrial and technical education will be wanting. Of course this will require time. But I think that that is exactly why an earnest endeavour should be made in this direction without any further avoidable delay.

Sir Fredrick Nicholson says in his Note on Japan :—

"The leap at education which the whole nation has made under the compulsory system is shown by the fact that while the primary school system was only formulated in 1872, by 1873 the number at these schools had already reached 28 per cent., by 1883, 51, by 1893, 59, and in 1904, 93 per cent. of children of a school-going age."

This furnishes us with an estimate of the time that will be needed and also an exhortation to move forward. It is upon this basis that industrial and technical education now rests in Japan. But the two kinds of instruction have grown together there, and so I think they should largely grow together here also. Towards this end, I should connect the measures of industrial and technical education which my colleagues have proposed, a little further with the system which already exists in the country. I would utilise the existing schools as far as possible not only for imparting a progressive course of drawing, but also for offering an optional course in elementary physics and chemistry, and carpentry and smithy. I would suggest that the Directors of Public Instruction of each province may be asked, in consultation with the Directors of Industries, to recommend changes in the curricula of the schools, primary, secondary and high, with a view

to make them practical, so that they may form a part of the system of technical education.

I cannot close this portion of my note better than by adopting, with necessary modifications, the concluding remarks of Mr. Samuelson on the subject of technical education :—

" In conclusion I have to state my deep conviction that the people of *India* expect and demand of their Government the design, organisation, and execution of systematic technical education, and there is urgent need for it to bestir itself, for other nations have already *sixty* years' start of us, and have produced *several* generations of educated workmen. Even if we begin to-morrow the technical education of all the youths of twelve years of age who have received sound elementary education, it will take seven years before these young men can commence the practical business of life, and then they will form but an insignificant minority in an uneducated mass. It will take fifteen years before those children who have not yet begun to receive an elementary education shall have passed from the age of 7 to 21 and represent a com} etely trained generation ; and even then they will find less than half of their comrades educated. In the race of nations, therefore, we shall find it hard to overtake the *sixty* years we have lost. To-morrow, then, let us undertake with all energy our neglected task ; the urgency is twofold,—a *small proportion* of our youth has received elementary, but no technical education : for that *portion* let us at once organise technical schools in every small town, technical colleges in every large town, and a technical university in the metropolis. The *rest* of the rising generation has received no education at all, and for them let us at once organise elementary education, even if compulsory."

The Training of Mechanical Engineers.

I fully agree with my colleagues as to the necessity of a full measure of practical workshop training for artisans, foremen and mechanical engineers. But I have doubts whether the system they propose would give sufficient general liberal education to even would-be mechanical engineers. I also apprehend that the schools attached to railway workshops will not admit of a sufficient number of Indians obtaining training in them. My colleagues also say that as the development of the country proceeds the number of students will increase. I join with them, therefore, in recommending that the existing engineering colleges should make provision for the higher technical instruction of mechanical and electrical engineers. I would only add that substantial grants should be given to these colleges for this development and the standard of education demanded of the mechanical engineers whom they are to educate, should not be inferior to that of a B. Sc. in Engineering of the University of London. This would be best secured by attaching these colleges to Universities, where this is not already the case.

There are at present only two teaching Universities in India. I hope that the Calcutta University will soon develop further teaching functions. In my opinion every teaching University should be encouraged to provide instruction and training in mechanical and electrical engineering under its own arrangements. The needed measure of workshop practice can be provided by arrangements with railway and other workshops existing in or near the cities or towns where they exist ; and where this may not be feasible, they should be encouraged to establish sufficiently large workshops to be run on commercial lines as a part of their engineering departments. Under such an arrangement the students will be able to spend their mornings in the workshops and their afternoons at the

classes at the University, they will live in an atmosphere of culture, and will cultivate higher aims and ideals than they are likely to, in schools attached to railway workshops. As our mechanical engineers are to play a great part in the future development of the country, it seems to me highly desirable that they should combine culture and character with expert knowledge and technical skill. And nothing is better calculated to ensure this than that they should be brought up under the elevating influences of a University and should bear its hall-mark.

I would also recommend that provision for the training of electrical engineers should be made simultaneously with that for mechanical engineers, and should not be postponed to an indefinite future date. I think it will not be long before electrical manufactures will be started in India. The need for these is fully pointed out in the chapter on the industrial deficiencies of India. The use of electrical machinery is steadily growing, and will grow at a more rapid rate in the future ; and, if even for present requirements, we leave it to the managers of electrical undertakings to train their own men, we shall be driving an increasing number of Indian youths to go abroad to be trained as electrical engineers.

Higher Technological Training.

I agree with my colleagues that it is urgently necessary to prepare for a higher technological training which will provide the means whereby the science students of the colleges affiliated to the Universities may learn to apply their knowledge to industrial uses, and that the simplest way of meeting this demand will be to expand the engineering colleges by the creation of new departments for the higher technical instruction of mechanical and electrical engineers. But I doubt whether it will be best to add departments of general technological chemistry to these engineering colleges where they are not parts of a teaching University. Where they are not, I think that they should be developed into full colleges of engineering, by provision being made for teaching other branches of engineering in them, such as railway engineering, and sanitary engineering, for which no satisfactory provision exists here at present.

As regards the teaching of general technological chemistry, I would recommend that this should be developed at the teaching Universities and at first-rate colleges affiliated to Universities. Every one of these has a more or less well-equipped laboratory, and by special grants, such as are given by the Board of Education to Universities and University Colleges in the United Kingdom, they should be helped to strengthen their staffs and to improve their laboratories for this purpose. We should thus give a practical value to the teaching of chemistry which is going on at present in our colleges. In view of the industrial expansion which we expect, the demand for students trained in general technological chemistry is likely to be very great. If provision is made for teaching it at the Universities or University Colleges, a much larger number of students is likely to be attracted to it than if it is made at engineering colleges. A sufficient number of scholarships and fellow-

ships should be provided at every one of these institutions to attract and encourage bright students to devote themselves to the subject.

Imperial Engineering Colleges or an Imperial Polytechnic Institute.

My colleagues think that it will be necessary ultimately, if not in the immediate future, to provide India with educational institutions of a more advanced character. They think that, for some time to come, the demand for this higher training can best be met by the provision of scholarships to enable students to proceed abroad; but that as soon as our foregoing recommendations have had time to develop their full effect, it would be advisable to proceed further and establish at least two imperial colleges of the very highest grade, one of which should cover every branch of engineering, while the other should be devoted mainly to metallurgy and mineral technology, the developments of which are certain to be on a very extensive scale. They say that this ideal should always be kept in sight as the goal.

I agree with my colleagues that in the immediate future the demand for the higher training here contemplated can only be met by the provision of scholarships to enable students to proceed abroad. I go further. I think that even when we have established our proposed higher colleges, we shall have to send our best scholars abroad to improve and perfect their knowledge. With all the provision for higher education which Japan has made in her own country, she has continued to send a large number of her students abroad. The Japanese Year Book for 1917 shows that there were 2,213 *ryugakusei* or foreign-going students, staying abroad in 1915—the bulk of them in the United States of America. The number of students of both sexes which Japan has sent to Europe and America since the opening of the country to foreign intercourse must reach enormous figures, says the same Year Book, especially when students who have gone abroad at their own expense are included. The demand for expert knowledge and technical skill will be so great in India, if we are to achieve in any measure the progress we desire, that it is desirable that the provision for scholarships should be greatly increased, and students should be largely selected as is done in Japan, from among those who have done teaching work for some years after completing their academic courses.

But after all that may be done in this direction, the large needs of the education of the youth of a country which is equal to the whole of Europe minus Russia, cannot be met in this manner. Those needs, and the vast possibilities of development which lie before us, demand that at least one first-class Imperial Technological or Polytechnic Institute should be established in India without any further delay. Indian public opinion has long and earnestly pleaded for the establishment of such an institute in the country, as witness the resolutions of the Indian National Congress and the Indian Industrial Conference, and of various Provincial Congresses and Conferences. Here again Japan furnishes us

an example. Japan recognised the need and value of a similar institution when she started on her present career.

"When Iwakura's embassy was in London in 1872, the attention of Mr. (now Marquis) Ito was drawn to the advisability of starting an engineering college in Tokyo to train men for the railways, telegraphs, and industries which were to be started in Japan, and he procured, through a Glasgow Professor, the services of Mr. Henry Dyer to organise this college, eventually merged in the University of Tokyo." [(*The Educational System of Japan* by W. H. Sharp, 1906, page 206.)

Since then Marquis Ito has repeatedly spoken of the establishment of this College as one of the most important factors in the development of Japan, since from it have come the majority of engineers who are now working the resources and industries of that country. (*Japan by the Japanese*, page 65.) Mr. Dyer was assisted by a number of foreigners to whom Japanese were added as soon as possible. The course then extended over six years, the last two years being spent wholly on practice. The college being under the Public Works Department, the students had the run of all the engineering establishments and works under its control; and graduates who were sent abroad for further work invariably distinguished themselves.

I earnestly hope that with the distressful record, to which our Report bears witness, of all the loss and suffering which India has undergone owing to the want of sufficient and satisfactory provision for technical and technological instruction in this country, the Government will be pleased not to delay any further the institution of an Imperial Polytechnic Institute in India. This is absolutely demanded in the interests of the country and the large recommendations which we make for industrial development.

My colleagues have recommended that there should be at least two imperial colleges established, one to cover every branch of engineering, and the other to be devoted mainly to metallurgy and mineral technology. I think both these departments should be combined in one polytechnic institute, and that all important branches of chemistry should be provided for in the third department. My colleagues have not recommended an imperial college of chemistry, evidently because they have recommended the institution of a separate service for chemistry. Even assuming that a separate service is to be constituted for chemistry, it cannot be accommodated better, for its headquarters, than as a department of the Central Imperial Polytechnic Institute of India.

Under the heading of Miscellaneous Educational Proposals my colleagues refer to the question of providing for training in navigation and marine engineering. I hope this will be done at an early date. I do not share the doubts of my colleagues that the industry of ship-building is not likely to be materialised for some time in India. I hope that, considering the huge volume of import and export trade of India and considering also the indigenous resources for ship-building, with those that exist in the country at present and those that are likely to be developed in the near future, ship-building should be specially encouraged by the Government, even if it should be necessary for some time to import

plates and sections from abroad. And for this reason I think that a school should be started in India at an early date to train people in navigation and marine engineering.

Commercial Education.

Among other proposals my colleagues have drawn attention to the importance of commercial education. While appreciating the good work of the Sydenham College of Commerce, they say :—

"There is a strongly expressed desire for similar colleges in other parts of India, and we think that the other Indian Universities might well consider the possibility of satisfying this demand. Industry and commerce are bound to go on expanding with rapidity, and they will be glad to pay a higher price for more efficient employés."

I entirely agree with this opinion. But I think that in view of the great and growing importance of commercial education, the Government should invite the Universities to establish Commercial Colleges and should help them to do so by substantial grants. I would reproduce here what I wrote in 1911 on this subject :—

"The importance of commercial education, that is, a special training for the young men who intend to devote themselves to commercial pursuits—as a factor in national and international progress—is now fully recognised in the advanced countries of the West. Those nations of the West which are foremost in the commerce of the world have devoted the greatest attention to commercial education. Germany was the first to recognise the necessity and usefulness of this kind of education. America followed suit; so did Japan; and during the last fifteen years England has fully made up its deficiency in institutions for commercial education. The Universities of Birmingham and Manchester have special Faculties of Commerce with the diploma of Bachelor of Commerce. So has the University of Leeds. Professor Lees-Smith who came to India two years ago at the invitation of the Government of Bombay, in addressing the Indian Industrial Conference at Madras said :—'The leaders of commerce and business need to be scientifically trained just as a doctor or a barrister or professional man is . . . Modern experience shows us that business requires administrative capacity of the very highest type. It needs not merely technical knowledge, but it needs the power of dealing with new situations, of going forward at the right moment and of controlling labour. These are just the qualities which Universities have always claimed as being their special business to foster; and we therefore say that if you are going to fulfil any of the hopes which were held out yesterday by your President, if you are going to take into your own hands the control of the commerce of this nation, then you must produce wide-minded, enterprising men of initiative, men who are likely to be produced by the University Faculties of Commerce. The University Faculty of Commerce is intended, of course, to train the judgment and to mould the minds of men. It is claimed that although it must give primarily a liberal education, it is possible to give that education which has a direct practical bearing on business . . . That kind of man (a man so trained) has immense possibilities in the world of commerce; he is the kind of man on whom you must depend to lead you in the industrial march in the future.'"

When it is remembered that the export and the import trade of India totals up more than 300 millions every year, it can easily be imagined what an amount of employment can be found for our young men in the various branches of commerce, in and out of the country, if satisfactory arrangements can be made to impart to them the necessary business education and training. Here also the experience and practice of Japan afford us guidance and advice. Higher commercial education has made great progress in Japan during the last twenty years. Before the end of the last century the candidates who sought advanced commercial

education at the Tokyo Higher Commercial School exceeded a thousand a year, though the school could accommodate a much smaller number then. Since 1901 Higher Commercial Schools have been established at Osaka, Kobé, Nagasaki and Yamaguchi, and at the Waseda University. In banks and other firms, graduates of commercial schools have been employed to an increasing extent every year. 'Formerly it was held that no advanced education was needed for a merchant! But to-day stern reality shows that the management of any large-scale enterprise must be undertaken only by the highly educated.' Experience in Japan has shown that though in the earlier years, the talented youth of the country sought places in official circles, as commerce and industry began to grow even those who had made a special study of politics and law, not infrequently chose to enter the commercial world; and I believe that in view of the industrial development which our recommendations foreshadow, if a College of Commerce is established in every major province of India, a number of our young lawyers, who find the bar overcrowded, will be glad to take advantage of such education and become efficient means of promoting the growth of industry and commerce in the country.

Land Acquisition in relation to Industries.

Section 39 of the Land Acquisition Act lays down that the provisions of sections 6 to 37 (both inclusive) shall not be put in force in order to acquire land for any company, unless with the previous consent of the Local Government, and section 40 of the Act says that "such consent shall not be given unless the Local Government be satisfied, by an inquiry held as hereinafter provided,—(*a*) that such acquisition is needed for the construction of some work, and (*b*) that such work is likely to prove useful to the public." There is no appeal against an order of the Local Government giving its consent to the acquisition of any land on the ground that it is likely to prove useful to the public, and complaint has been made that the power given by the Act to the Local Government has been misused. I know of one instance where this power was used two or three years ago to acquire land to enable the Young Men's Christian Association to establish a club and recreation ground. The protests of the unfortunate house-owners who were dispossessed were unheeded. It cannot be disputed therefore that the section as it stands has been differently interpreted. A remedy may be provided against its being further misinterpreted by having the expression "is likely to be useful to the public" qualified by an amending Act. But however that may be, I do not share the doubt whether that Act can be fairly used by a Local Government on behalf of an industrial company. I think it cannot be.

Nor can I join my colleagues in making the recommendation that the Local Government may acquire land compulsorily from private owners on behalf of an industrial concern, even in the circumstances and under the conditions specified by them. The Indian Act is framed on the analogy of the English Acts on the subject of the compulsory

acquisition of land for public purposes. If the expression "likely to be useful to the public" is interpreted in the manner in which it would be interpreted under the English Acts, there will be little room left for doubt as to its meaning. Describing the scope of the Lands Clauses Acts, the Encyclopædia of the Laws of England (Vol. 8, pages 3-6), says :—

"The provisions as to the incorporation of the Lands Clauses Acts apply to all Acts authorising the purchase of lands whether general or local. Such Acts fall into three classes :—

1. Acquisition of lands for purposes of national defence or general Government.
2. Acquisition of lands for public purposes of a local or municipal character.
3. Acquisition of lands by corporations or individuals for commercial purposes of public utility.

Dealing with 3, *i.e.*, Commercial purposes of public utility, it says :—

"Under this head fall the bulk of the special, local, and personal acts which incorporate the Lands Clauses Acts. They fall into the following main classes :—

1. Cemeteries.
2. Electric lighting, effected by provisional orders confirmed by statute.
3. Gasworks.
4. Harbours.
5. Markets and Fairs.
6. Waterworks.
7. Railways and light Railways.
8. Tramways.

In all cases, except that of ordinary railways, these undertakings can, under general Acts, be entrusted to municipal bodies."

A glance at the list given above is sufficient to show that every one of the commercial objects for which land may be required is an object of public utility, *i.e.*, one to the benefit of which every member of the public has an equal right with every other member, by complying with the rules which may be prescribed therefor. The test of it is clearly indicated in the last sentence which says that "in all cases, except that of ordinary railways, these undertakings can, under general Acts, be entrusted to municipal bodies." The justification for depriving a man of his property against his will, may be found in the fact that it is being done not for the benefit of any individual or group of individuals, but for the benefit of the public of which he also is a member, and that he will be entitled to share the benefit of the undertaking as much as any other person. Where an undertaking is not "likely to be useful to the public," in the sense indicated above, the provisions of the Act, or the power of the Government, cannot in my opinion be rightly used to compulsorily acquire land for it. In my opinion, when an industrial concern, the members of which have the right to shut out every one outside their body from participation in the benefit of their business, desires to acquire land, it must do so by exchange, negotiation or moral suasion.

Industrial Finance.

We were asked to report in what manner Government could usefully give encouragement to industrial development by direct or indirect

financial assistance to industrial enterprises. We are all agreed that the lack of financial facilities is at present one of the most serious difficulties in the way of the extension of such industries, and that it is necessary that much greater banking facilities should be provided than exist at present. We have come to the unanimous conclusion that along with the other measures of assistance which we have to recommend, the establishment of industrial banks, working on approved lines, would be a potent means of removing these difficulties and of affording help to industrialists, and that such difficulties are of sufficient national importance to justify Government assistance. The recent establishment of the Tata Industrial Bank is a matter of sincere satisfaction. But there is need for more institutions of the same class. And it is because we had not sufficient material before us to enable us to formulate a definite scheme for industrial banks, that we have recommended that an expert committee should be appointed at the earliest possible date

"to consider what additional banking facilities are necessary for the initial and for the current finance of industries; what form of Government assistance and control will be required to ensure their extension on sound lines as widely as possible throughout the country; and whether they should be of provincial or of imperial scope, or whether both these forms might not be combined in a group of institutions working together."

As the adequate extension of industrial banks will be a matter of time we have recommended a scheme to meet the need experienced by middle-class industrialists for current finance. I do not quite like the scheme, as it involves too much of spoon-feeding. But as it is professedly a temporary arrangement, I raise no objection to it. I only hope that its acceptance will not in any way delay the adoption of a scheme of regular industrial banks, and that it will be unnecessary to continue this temporary scheme very long.

If industrial development is to take place on anything like the large scale which our Report contemplates, nothing is more important than that regular banking facilities should be multiplied manifold, and that as early as may be practicable. To clear the ground for this it is necessary to remove some misconceptions. Since the failures of certain Indian banks in 1913 and 1914, an opinion has grown up in certain circles that Indians lack the capacity to manage joint-stock banks. When those failures occurred certain foreign papers held these *swadeshi* banks up to ridicule. That there were mistakes both of policy and of management in the case of some of these banks is indisputable. But these mistakes should not be exaggerated, and they should not be made the basis of an indiscriminating condemnation of Indian capacity for joint-stock banking and for extolling the capacity of Europeans for such business. A certain number of failures has been a common feature in the history of joint-stock banking, in England and America as well. Englishmen regard the Bank of England, and with pardonable pride, as the greatest financial institution in the world; and yet even that institution—the safest bank in the whole of the United Kingdom—has had its share of vicissitudes. "From 1819 to 1870, the Bank of England came to the verge of bankruptcy every ten years" (*History of*

the Bank of England by Dr. Andreades, page 401), while the list of Banks that failed in England is of enormous length. To mention only a few, during the years 1791 to 1818 about a thousand banks suspended operations in England. In the financial depression of 1839, 29 banks went out of existence, out of which 17 had never paid any dividend. In the year 1862 the Limited Liability Law was passed, and within the space of three years 300 companies were formed with a nominal capital of 504 million pounds, of which 270 failed shortly afterwards. This was followed by a financial crisis in which a large number of banks failed, and the greatest of them, Overend Gurney, with liabilities of £18,727,917 closed its doors on the morning of what is known in the history of banking in England, as the Black Friday. Other banks failed also. The estimated liability of the various failures amounted to 50 millions and the losses were also very great. In 1890 the great firm of Baring Brothers, which had helped the Bank of England out of its difficulties in 1839, failed. Have these numerous failures led to any general condemnation of Englishmen as being unfit to manage joint-stock banks ? Why then should the failures of a few banks started by Indians lead to any such general inference being drawn against them ?

Let us now turn to the history of banking in India. The first joint-stock bank was started in 1770 by Messrs. Alexander and Co. It was called the Hindustan Bank. It issued notes. These notes, though not recognised by the Government, obtained a local circulation which occasionally reached 40 or 50 lakhs. They were received for many years at all the public offices in Calcutta, scarcely excepting the treasury itself. This bank failed in 1832. In 1806 was established the Bank of Bengal, but it received its charter of incorporation in 1809. The East India Company contributed one-fifth of the capital and appointed three of the Directors. Since 1809, and more particularly from 1813, when the Act was passed which removed certain restrictions from Europeans settling in India, banking received a stimulus and several banks were established. Between 1829 and 1833 most of these agency houses failed. In 1838 a joint-stock bank named the Union Bank was started. It was intended to afford in the money market that facility which the Bank of Bengal owing to its charter could not afford. The bank failed in January 1848, although long before that it was known to be " in a hopelessly insolvent state." " The dividends it declared and of which it made so great a parade were taken not from the capital, for that had gone long before, but from the deposits that people were still confiding enough to make." " The bank had indiscriminately invested in indigo and the Directors freely helped themselves to the bank money." One English firm were debtors to the bank of 24 lakhs of rupees, one-fourth of the whole capital of the bank, and another firm had taken cash credits to the amount of 16 lakhs of rupees. There were scandals connected with the failure of the first Benares Bank in 1849. The Bank of Bengal itself violated its charter in the crisis of 1829-32. The first Bank of Bombay was established in 1840, the Bank of

Madras in 1843. These banks were established under conditions similar to those of the Bank of Bengal, with the East India Company as a share-holder of one-fifth of the capital. In 1868 the Bank of Bombay failed. A Commission was appointed to enquire into the causes of the failure. The Report of the Commission, which was published in 1869, ascribed the failure to the following causes :—

"(a) The Charter Act 'which removed many restrictions contained in the former Act and permitted the Bank to transact business of an unsafe character';

"(b) 'The abuse of the powers' given by the Act 'by weak and unprincipled secretaries';

"(c) The negligence and incapacity of the Directors;

"(d) The very exceptional nature of the times."

Sir C. Jackson (President of the Commission) summed up his views on this point in the dictum that—

"The great lesson the failure taught was that banks should not lend money on promissory notes in a single name or on joint promissory notes, when all the parties were borrowers and not any of them sureties for others."—(*An Account of the Presidency Banks*, page 31.)

I draw attention to this with special reference to the statement contained in paragraph 284 of our Report that "we have received evidence in favour of a relaxation of the restrictions of the Presidency Banks Act, which prevent loans from being for longer than six months, and require the security of two names."

Another bank of the same name with similar rights, but this time without the contribution of the Government was started in the same year in Bombay. It worked well till 1874, in which year appeared a famine in Bengal. The Government balance at the Bank was one crore, and it was intended that 30 lakhs might be drawn to purchase rice from Burma for the purposes of relief in Bengal. The Bank was unable to pay the money. It did not close its doors only because the money was due to the Government. This incident gave rise to the Reserve Treasury system, which dates from 1876. In this year was also passed the Presidency Banks Act which imposed important limitations on the Banks.

Of the seven European banks that existed in India in 1863, all but one have failed. That one is the Allahabad Bank. About 1875 five new banks were established. Of these only one, *viz.*, the Alliance Bank of Simla, Limited, the Punjab Banking Co. having been amalgamated with it, survive. Amongst those that failed was the Himalaya Bank, Limited, which stopped payment in 1891. Besides these joint-stock banks, the big banking firm of Sir George Arbuthnot failed in 1907. The Bank of Burma was established in 1904. It failed in 1911. When it failed it had a working capital of a crore and 19 lakhs. It was found that one-third of the working capital had been advanced to a firm in which the Directors were interested. Last of all came the failure of the Bank of Upper India. Indians were not responsible for the management of any of these banks. They were all managed by Europeans.

The history of the Indian banks for which Indians were responsible is neither so long nor so eventful. It goes back only to the year 1881,

in which year the Oudh Commercial Bank was founded. It was followed by some other small banks. The Punjab National Bank was established in 1894. Both these banks have carried on their business without interruption. The People's Bank of India was founded in 1901. When it closed its doors in 1913, it had nearly a hundred branches in various places, mostly in Upper India. The other ill-fated institution, the Amritsar Bank, was started in 1904. It failed in 1913. With the year 1905—the year of the partition of Bengal—began an era of new *swadeshi* indigenous activities in India and from 1906 there began to be established banks large and small all over the country. These totalled 476 in 1910. The most important of these were the Bank of India and the Indian Specie Bank, started in 1906, the Bengal National Bank and the Indian Bank of Madras in 1907, the Bombay Merchant Bank and the Credit Bank of India in 1909, the Kathiawar and Ahmedabad Banking Corporation in 1910, and the Central Bank of India in 1911. Of the eleven important banks started since 1901, six collapsed during 1913-14. But taking large banks and small, in all about two dozen Indian banks failed. Though the failure of even one bank is a matter for regret, two dozens out of 476 cannot be said to be a very large number.

There is no doubt that in some of the banks that failed there was a fraudulent manipulation of accounts, and that in others large sums of money were advanced to enterprises in which some of the directors were interested. There were also mistakes of policy, as for instance, in the financing of long-term business with short-term deposits, and the sinking of far too great a proportion of these funds in a single industry. But that the failures were due more to these causes than to dishonesty and fraud is attested by the fact that the number of criminal prosecutions in connection with these failures has been conspicuously small.

Regarding the failures in the Punjab, Pandit Balak Ram Pandya, Auditor of Accounts, Lahore, said in his written evidence submitted to us :—

"Indeed, when we compare the recent bank and industrial failures in the Punjab with similar incidents in other countries, we are astonished at the comparatively small proportion of cases in which the failures in our case were due to dishonesty or selfishness. The price we have paid for our inexperience is undoubtedly heavy, but it is by no means heavier than what other countries have paid before us. If we have only learnt the lesson which the disasters of the last four years so impressively teach, there is surely no room for despondency."

In pursuance of a recommendation contained in the preliminary note on the scope of enquiry by the Indian Industrial Commission, a Committee was appointed by the Punjab Provincial Industries Committee to examine and report upon the causes of the recent failures in financial and industrial enterprises in the Punjab. Their report throws much valuable light upon the subject. The Committee said :—

"All the evidence produced before us insisted on the want of business knowledge and experience in company promoters, managers, and staff as a primary cause of failure. There were few competent managers, whether of banks or of industrial concerns. Consequently egregious blunders were made, and some of the so-called dishonesty seems to us very like ignorance ; much of it was due to anxiety to cloak losses."

After describing the defects and mistakes of the banks, the Committee said:

> Lest, however, it should be imagined that the state of *swadeshi* banking and industry was altogether rotten, we must hasten to point out two relieving features: (*a*) in the first place the survival of the Punjab National Bank showed that a purely Indian directorate and staff were capable of steering a bank through circumstances as trying as ever any financial institution had to face; (*b*) and again the fact that several banks, as the following statement shows, have paid in full, and others are likely to pay, is evidence that by no means all of the banks were inherently unsound."

(I omit the statement because I understand that much more has been paid up since June 1917, when the Committee made their report.)

The Committee summed up the result of their investigation as follows :—

> " Thus, speaking generally, our feeling is that the collapse can be referred to two fundamental causes :—
>
> (*i*) The inexperience, and the defects of the machinery, inevitable to the starting of every new venture;
>
> (*ii*) The lack of palliation or remedial action such as Government itself, or quasi-Government agencies, *i.e.*, a State-supported Provincial Bank, might supply."

Indians need Government Support and Education in Banking.

This brief review would, I hope, make it clear that there is little ground for any general disparagement of Indians in the matter of joint-stock banking. It shows that if Indians receive (*a*) the same sympathy and support from the Government which Europeans have received through the Presidency Banks, and (*b*) if they also receive the necessary measure of education in modern banking, Indians will give as good an account of themselves in this branch of important national activity as any other people have given. As regards the first, I would strongly recommend that the question of a Central State Bank, having branches in every Province, should be taken up at an early date. The Presidency Banks have rendered inestimable service to Europeans in carrying on trade and commerce with India. They cannot under their existing charter help industries. There has also been a complaint that even in matters of such loans as they can advance, and do advance to Europeans, these banks do not easily accommodate Indians. This complaint found strong expression at Lahore. The Official Committee of Lahore to which reference has been made before, said in their report :—

> " During the crisis there was no co-operation between the Indian banks themselves, or between them and the English banks, or between them and the old-fashioned Indian banks. We attach peculiar significance to the statements made by witnesses as to the position of the Bank of Bengal. While the fact that the Punjab National Bank has been received on the clearing list—only, however, after surviving the crisis—shows that at present good relations do exist and that there is future possibility of better, yet the absence of a provincial bank probably meant the downfall of sound banks which might have been saved. The Bank of Bengal is too big, not local in its sympathy, ignorant of provincial conditions, and not susceptible to the influence of the Provincial Government. The Lahore Branch was willing to help and made recommendations to Calcutta, but these were rejected with curtness, and not even on the deposit of Government paper would the Bank of Bengal consent to advance money to the Punjab National Bank."

When the Government withdrew the right of issuing notes from the Presidency Banks in 1860, they agreed to help them by allowing the use

of public balances. In a Finance Department memorandum of 20th December 1860 to the Bank of Bengal (quoted by Mr. Brunyate at page 81 of his "Account of the Presidency Banks") the extent to which the Government admitted the obligation to compensate the Banks for the withdrawal of the right of issue was indicated as below :—

"The Bank (of Bengal) cannot be admitted to have any claim *as of right* to compensation, but they are certainly in a position deserving of much consideration and one in which they may equitably look for all reasonable support on the part of Government."

Government agreed to compensate them by giving them their cash balances without interest, to the extent of 70 lakhs to the Bank of Bengal and 50 lakhs to the Banks of Bombay and Madras. In practice the Banks have been allowed to enjoy the use of much larger balances during the decades that have since passed. But as Mr. Brunyate points out in his book at page 99 :—

"Long before 1876 the Secretary of State had come to the conclusion that the Banks had been sufficiently compensated for the loss of their note issue."

It is high time therefore that the Government should cease to place public balances with the Presidency Banks and that these balances should be kept in a State Bank, the benefits of which would be available to a larger public.

The proposal for a single "Bank of India" to take the place filled by the three Presidency Banks was before the Government between 1860 and 1876. But no decision was arrived at on the subject. The question was taken up by the Royal Commission on Indian Finance and Currency. They expressed no final opinion upon it, but recommended that it should be taken up at an early date. They said in paragraph 222 of their Report :—

"We regard the question, whatever decision may ultimately be arrived at upon it, as one of great importance to India, which deserves the careful and early consideration of the Secretary of State and the Government of India. We think, therefore, that they would do well to hold an inquiry into it without delay, and to appoint for this purpose a small expert body, representative both of official and non-official experience, with directions to study the whole question in India in consultation with the persons and bodies primarily interested, such as the Presidency Banks, and either to pronounce definitely against the desirability of the establishment of a State or Central Bank in India at the present time or to submit to the authorities a concrete scheme for the establishment of such a bank, fully worked out in all its details and capable of immediate application."

This recommendation was made in 1914. The consideration of it was postponed because of the war. I can only express the earnest hope that it will be taken up as early as may be practicable. The interest of the country demands the early creation of an institution which will at once be the central reservoir to which all public balances should belong and the central fountain which will feed all fruitful national activities throughout the country.

Not the least important advantage of the establishment of a State Bank will be that adequate facilities will be provided for training Indians in banking work. The need for such training is obvious. In paragraph 282 of the Report my colleagues say :—

"But there is in India at present a lack of trained bank employés, owing to the absence in the past of facilities for commercial education and of any regular system of training

Indians in banking work, while the country folk do not yet realise the advantages to themselves of organised banking. For these reasons, the extension of banking in the mofussil has been slow. Where, as in the case of the Punjab, too rapid progress was made, it was attended with grave risks and followed by disaster. There was mismanagement at the headquarters of the banks, and many of the branches did little but receive deposits."

The opinion of the Lahore Committee, which I have quoted above also emphasised the need of promoting a knowledge of banking business. Here again I would draw attention to the marvellous development of banking in Japan. At the time of the Restoration in 1868 "ignorance concerning the methods of foreign finance, or of banking, or of joint-stock companies was universal, although Japan was not entirely without some financial machinery." "National Finance and economy were both in a perilous condition." "The Japanese had not been accustomed either to the combination of capital or the formation of corporations. They had undertaken every enterprise individually, and the financial businesses which then existed were not in a prosperous condition." "As early as 1870, Mr. Hirobumi Ito (afterwards Prince Ito), of the Finance Department, memorialized the Government that the proper management of finance and economy was the foundation upon which the State affairs must be conducted, and that unless sound institutions were established for this purpose no good administrative results could be attained." At his suggestion he was sent in the same year to America to study financial institutions and their working. And as the result of his observations he submitted to the Government the following three propositions :—

"First, the standard of currency should be gold ; secondly, bonds should be issued for the conversion of the notes ; thirdly, companies should be established for the purpose of issuing paper money."

After much discussion of these and certain alternative proposals, regulations were drafted in 1871 and promulgated with the sanction of the sovereign for organising National Banks. The first National Bank was established at Tokyo in 1873, and began business in less than ten months. It is not necessary for me to trace the history of banking in Japan further than to say that there are now five kinds of banks in Japan, viewed in relation to the line of business respectively followed, *viz.*, (*a*) Home trade, (*b*) Foreign commerce, (*c*) Industry, (*d*) Agriculture and (*e*) Colonisation ; and that in 1913 the total number of these banks was 2,152, of which 2,100 represented ordinary and savings banks at the end of the first half-year, and 52 in number of special banks at the end of the year. The paid-up capital of these banks amounted in 1913 to 436,188,271 yen, the reserve fund to 139,109,917 yen, the total deposits to 10,811,884,300 yen.

In "Fifty Years of New Japan" (by Count Okuma, Volume I, page 532) Baron Shibusawa, the President of the First National Bank, concludes his chapter on the development of banking in Japan as follows :—

"Before concluding this essay the writer cannot refrain from expressing his profound satisfaction at the fact that the small spring of banking business, which had been so insignificant at the time of the Restoration, has, by a gradual process of accretion, become a broad, navigable river, as it is now, and his conviction that this is the result of having

followed the example of European and American nations, to which the Japanese are much indebted. Again the Japanese are very grateful for the valuable services of Mr. Alexander Allan Shand, now a Director of the Paris Bank, London, who came to Japan at the invitation of the Issue Department in 1872, acted as Adviser in banking to that Department, wrote valuable books on banking, instructed young Japanese in that line and thus paved the way for the development of banking business in the country."

India was far ahead of Japan in 1872. She stands far behind Japan to-day. No doubt banking in India to-day is far in advance of what it was in Japan in 1872. But if it is to develope as it should, I would recommend that the Government of India should do even now what the Government of Japan did long ago, *viz.*, take definite steps to impart the best instructions to young Indians in banking through the best teachers it can appoint. Even if a State Bank should be slow in coming, the Presidency Banks and other banks which receive help from Government, should be asked to take in a few Indians—preferably graduates of a College of Commerce—as apprentices for higher training in banking.

Provincial Departments of Industries.

I agree with my colleagues in recommending the creation or development of provincial Departments of Industries, subject to the reservations noted below :—

(1) *Report, paragraph 306* (c).—I think that the control of technical and industrial education should not be placed under this department but either under the Department of Education or under a committee jointly appointed by the Departments of Education and Industries. In my opinion this arrangement will secure that both the theoretical and practical sides of technical and industrial education will receive sufficient attention.

The proposed multifarious other duties of the Director of Industries will leave him little time to direct the work of education. It is contemplated (paragraph 331 of the Report) that the Deputy Director should inspect institutions for technical education. It will not make for efficiency if the Director is made responsible for duties which he will evidently not be able to perform.

2. *Report, paragraph 307.*—I think that agricultural engineering should be under the control of the Director of Agriculture. Agricultural engineering will not be confined to " putting in power plant for agricultural work." It will include questions relating to drainage and irrigation also. These questions are of far greater importance than the mechanical putting in of power plant, which can be carried out by the engineering staff with no less efficiency if the staff be under the control of the Director of Agriculture than if it be under that of the Director of Industries.

3. *Report, paragraph 312.*—I do not think that the Director of Industries should be the Secretary to Government for commercial and industrial subjects. If he is, the object of referring his proposals to the scrutiny of the Member in charge of the department, will. I fear, be largely defeated in practice. Considering that the Director will deal with large interests, it is desirable that that scrutiny should be real.

4. *Report, paragraph 313.*—The salaries which have been proposed for the Director and the Deputy Director have evidently been proposed from the point of view that these officers will be Europeans. In my opinion the salaries should be fixed from the point of view that they will be Indians, and it should be provided that, if a European is imported from abroad, an extra allowance of 25 per cent. above the salary shall be given him. I would suggest that the salary of the Director should be Rs. 1,000 rising to Rs. 2,000.

4. *Report, paragraph 314.*—The salary of the Deputy Director should range from Rs. 500 to Rs. 1,000.

5. *Report, paragraph 317.*—The salary of Circle Officers should range between Rs. 200 and Rs. 500.

6. The strength of the staff should be determined after the Director and Board of Industries have been appointed and have submitted a definite programme of work.

Imperial Department of Industries.

Report, paragraph 321.—I agree with my colleagues in recommending that Industry should have separate representation in the Executive Council of the Government of India.

Paragraph 322.—But I venture to doubt the necessity or desirability of the proposed Indian Industries Board. My colleagues have described the duties for the performance of which the Board is, in their opinion, needed. They say :—

(1) "*The Imperial Department of Industries would control the administration of the various Acts with which it is concerned.*"—The Member for Industry, with his Secretariat, will certainly not require a Board to help him to do this.

(2) "*And (it) would be responsible for the general direction of the accepted industrial policy of the country, including technical and industrial education.*"—Even without any reference to the expected devolution of power to provincial Governments, the Member for Industry will not require the assistance of a member of the Board to perform this duty either. The Member for Education performs a similar duty in regard to education. In paragraph 352 of the Report my colleagues state what they expect to be done under this head. They say :—

"Under heads 9 and 10 (Encouragement of industries, advice to Local Governments, and industrial and technical education), the only expenditure incurred by the imperial department would be in respect of the staff of visiting experts, who would work directly under the appropriate member of the Industries Board. The allotment of work among these should be effected by one of them, who might be styled Senior Visitor. The inspectors would be mainly concerned with industrial schools ; the inspection on behalf of the imperial department of the higher institutions would be largely performed by members of the Industries Board and other high technical officers."

I think the proposal to appoint these "imperial visiting experts," entirely lacks justification. They will be like the fifth wheel of a coach. But however that may be, all that members of the Industries Board are expected to do in this direction is to inspect "the higher institutions."

These institutions will be under provincial Governments. They are not likely to suffer for want of such "superior" inspection, and the Member for Industry may be expected occasionally to honour them by a visit when he is out on tour.

(3) "*The remaining duties of the department would consist of the initiation and running of any imperial pioneer and research factories that may be needed.*"—In paragraph 356 my colleagues say :—

"As instances of experimental factories which could be more appropriately started by imperial agency may be cited (*a*) glass works, an account of the range of experts needed, (*b*) wood distillation, which would yield results of very general application, and should be applied to a number of different species of trees. It would be for the Industries Board to decide on the best site for the factory in each case, and to determine the exact object of the experiment which should be placed in charge of a suitable specialist."

I do not see any reason why both these suggested factories should not be started as provincial undertakings in any province where conditions may be considered to be suitable for them. But assuming that they *may* be started as imperial factories, surely the Member for Industry, acting on expert opinion and advice, may be trusted to sanction such an experiment without the assistance of the proposed Board.

(4) "*The management of full-scale Government factories.*"—Presumably each such factory will have its manager or superintendent. When many such have been started, the need for appointing a general superintendent of such factories may be considered. But a highly-paid officer like a member of the proposed Board should not be required in connection with this work.

(5) "*The framing of schemes for assisting private enterprise of a class for which an imperial agency would be required.*"—The Member for Industry should be trusted to do this, when it becomes necessary to do it. It should be left generally to the provincial Governments to assist private enterprise whenever it may be held to be desirable. The policy should, in my opinion, be to avoid creating *a class* of enterprise for which an imperial agency would be required.

(6) "*The supply of stores.*"—For this a very large—perhaps unduly large—staff consisting of a Controller General, four Deputy Controllers, seven Assistant Controllers, six Inspectors, 20 Assistant Inspectors, and a Supervisor of Stores Contracts is proposed. It does not seem that any room is left for work for any member of the Industries Board here.

(7) "*The collection and dissemination of commercial and industrial information.*"—For this also there is a separate highly-paid Director, and it is proposed to give him two highly-paid Deputies for Calcutta and Bombay.

(8) "*And the direction of such scientific and technical services and departments as come under its control.*"—Every imperial service and department which may be constituted will have its appropriate head. With such head it should require little direction from outside. Such direction and general control as may be desirable can be exercised by the Member for Industry.

For all these reasons I think the creation of an imperial *executive* Board of Industries is not necessary. In my opinion an *advisory* Board should be constituted here also, as it will be in the provinces. It may consist of members largely elected by the Legislative Council and partly nominated by the Government. This will mean a saving of over 2 lakhs a year in salaries alone. But not the least important advantage of dropping the proposed Board would be that the Member for Industry would not be left without the charge of any specific branch of work, as he would be under the proposal of my colleagues (paragraph 323). The difficulty that my colleagues have felt in recommending where to locate the Board of Industries (paragraph 328) strengthens the doubt about its necessity. They say :—" We feel compelled to recommend that the headquarters of the Board should be with the Government of India." They " fully realise from the unsatisfactory experience of the past, the imperative necessity of keeping the activities of the Board in close touch with the industrial life of the country." But they think " that this need will be largely met by the fact that the officers controlling the various departments under it would be working in large industrial centres, while the members themselves would also have had considerable industrial experience and would tour regularly." They have also found it " difficult to select an industrial centre as the headquarters of the Board, without introducing a bias that might react unfavourably on other centres." My colleagues therefore reconciled themselves to the idea that the Indian Industries Board should be moving up to Simla and down to Delhi every year with the Government of India. But this does not seem to me to be a business-like arrangement.

Direction of Chemical Research.

I am doubtful as to whether the general direction of chemical research should be left to the Imperial Department of Industries. (Report, paragraph 324.) In my opinion it should be vested in the Faculty of Chemistry of the Chemistry Department of the Imperial Polytechnic Institute, which I have recommended. It seems to me anomalous and unscientific to entrust the direction of scientific research to an executive Government machinery like the proposed Imperial Department of Industries. I fear that the " distinguished chemist," who may be attached to the department, will develope in him more and more of an executive head and lose more and more of the scholar. At present a chemist who has completed an investigation is himself responsible for it and free to publish it. In the scheme proposed this freedom will be taken away from him. The judgment of the Chief Chemist will decide whether the result of any particular research work may or may not be published.

This is the age of specialisation. In order to achieve the highest distinction as a scientist a man must specialise in some particular branch of science. It will be difficult, if not impossible, to find a chemist, who will be equally strong in more than one branch of chemistry. Generally speaking, the Chief Chemist will not therefore be competent to pass final judgment upon research relating to any branch other than his own. Dr.

Bose must be the judge of Dr. Bose. It would be impossible for a man like him to work, when an official, however eminent a scientist he may be in his own particular subject, will have the power to reject or accept his work.

In the note submitted to us by Mr. Puran Singh, of the Dehra Dun Forest Research Institute, he has put forward a strong argument against research under the control of an administrative officer. The considerations urged by him merit attention. He says :—

"(1) Scientific and industrial research when carried on by Government departments, does not become as popular as it would be if it were associated with the Universities.

"(2) The work of the University professor, unlike that of the Government official, is open to public criticism and valuation not only at the hands of laymen but before the other Universities of the world. This accounts for the high standard of University work, a standard which it is the pride of the professor to maintain, not only for the sake of his own good name, but for the reputation of the University to which he belongs. A Government official, on the other hand, has to keep a limited circle satisfied with his work, and his reputation when once made in that circle, runs little risk of being marred, as he is safe under the protection of his official seat.

"(3) Up to this time in no country which encourages scientific research has it been possible for any one to aspire to the dignity of a professor of a University without having first risen through the ranks of student and assistant. On the other hand, in this country we see young men fresh from Universities appointed direct to responsible positions of research and educational work, and the stimulus for ever-increasing effort is in most cases lacking.

"(4) Research work by the agency of a Government department as such does not carry sufficient weight with the scientific bodies of the world.

"(5) The research officer should be in the nature of a democratic public man rather than a Government fficial, who is bound to become by the very nature of his environment somewhat of an autocrat.

"(6) Many public research institutes that have recently sprung up in this country indicate a desire on the part of the people to be rid of official control in order to carry on research as independently as is at present done in the Universities of other countries. Though the desire is thus indicated, yet all work in this direction is waste of energy if there exists no clearly defined and harmonious co-operation between Government and these private institutes. Such institutes are bound to starve finally through the lack of the University atmosphere, and the authority and resources, as distinct from control, of the Government at their back. The Universities of Tokyo and Kyoto have both the Government and, through the Government, the people at their back.

"(7) Education when given in colleges run by a Government department such as those of Agriculture and Forests, as distinguished from colleges affiliated to Universities, does not tend to efficiency. The teacher therein is neither properly responsible to the students and the public nor to the Government. This is because the Government has no means of judging the ability of the professor as such. The fact that no Government selection till now has proved a failure in research or in imparting scientific education is due to Government having unwittingly lent to them an authority and position which causes men of average attainments to appear as geniuses.

"(8) And lastly, it is a fact that no country in the world has followed the procedure adopted in this country for organising scientific and industrial research. This point is well illustrated in a recent number of 'Nature' by Mr. Hugh Robert Mill in reviewing a note on an enquiry by the Government of India into the relations between forests and atmospheric and soil moisture. He says :—'To our mind the method adopted could produce no better result than it appears to have done. In a scientific problem such as was set forth, the only function of the State seems to us to be to decide that such an enquiry shall be carried out at the public expense and that every facility for obtaining data shall be given by all the departments and all the Government concerns, local and central. It should then be handed over to a competent man of science, set free from all other duties and supplied with necessary assistants. His report, when complete, will be authoritative and epoch-making, if not final, and incidentally his own reputation would be made or marred by his handling of the facts. The total expense would

probably be no greater and the labour of many public servants would not be diverted from the work for which they were trained.'

"This comment emphasises exactly the point I am attempting to bring to your notice, *viz.*, that scientific research must be independent and in the hands of the best possible men."

I would therefore recommend that the control of research should be left not to the Imperial Department of Industries but to the Imperial Polytechnic Institute, if it is established, or to a Science Council elected by scientists working in the various Universities, Colleges and other scientific institutions in the country. The Departments of Industries, both provincial and imperial, should communicate their suggestions for research to the Institution or Council, and encourage the application of the results of researches made to industries so far as they can.

The Organisation of Scientific and Technical Services. The Indian Chemical Service. The Imperial Industrial Service.

In proceeding to discuss the important proposals of my colleagues in relation to the subjects noted above, I think it necessary to recall that the Commission was appointed "to examine and report upon the possibilities of further industrial development in India and to submit its recommendations with special reference to the following questions :—

(*a*) whether new openings for the profitable employment of Indian capital in commerce and industry can be indicated :

(*b*) whether, and, if so, in what manner, Government can usefully give direct encouragement to industrial development—

(*i*) by rendering technical advice more freely available ;

(*ii*) by the demonstration of the practical possibility on a commercial scale of particular industries ;

(*iii*) by affording, directly or indirectly, financial assistance to industrial enterprises ; or

(*iv*) by any other means which are not incompatible with the existing fiscal policy of the Government of India."

In concluding the resolution appointing us, the Government of India expressed the hope that the Commission would "find it possible to place their report in the hands of the Government of India within 12 months from the date of its assembling in India." This as well as the terms of our reference would show that we are expected to make recommendations as to openings for the profitable employment of Indian capital in commerce and industry, which could be carried out at an early date.

Chapter III of our Report which gives a summary of the industrial deficiencies of India, shows how various and how great are the openings in which Indian capital can be employed. We say there :—

"The list of industries which, though their products are essential alike in peace and war, are lacking in this country, is lengthy and ominous. Until they are brought into existence on an adequate scale, Indian capitalists will, in times of peace, be deprived of a number of profitable enterprises ; whilst in the event of a war which renders sea transport impossible, India's all important industries will be exposed to the risk of stoppage, her consumers to great hardship, and her armed forces to the greatest possible danger."

But as my colleagues say at page 4 our Report—

"although much information of technical and industrial value will be found in the evidence of some of the expert witnesses . . . we have concentrated our attention

on the machinery which we propose should be set up to effect industrial development generally rather than on the particular industries to be improved. This machinery will, we believe, do what is needed for all industries and it would be useless for us to attempt to frame detailed recommendations for which technical enquiries by experts are required."

With due deference to my colleagues, I think that we have concentrated too much attention on the machinery which has been proposed and yet, I fear that, excepting the provincial and imperial Departments of Industries, the machinery proposed will not promote industrial development as rapidly as the circumstances of the situation require. The scientific and technical services which they recommend will, on their own showing, take some time to organise, the industrial researches which they wish to promote, will take some time to bear fruit. In my opinion the immediate requirements of the country in the matter of industrial development, require the adoption of measures which will bear fruit more speedily.

There are two classes of industrial enterprises which can be taken up in this country. The first class, and this is by far the larger class, consists of those which can be started by the importation of machinery and experts as first managers. In this class of work we have to imitate and not to initiate. As soon as the provincial Departments of Industries, with their Advisory Boards, have been constituted in the provinces, they should decide, with such expert advice as may be necessary, what industries of this class can be started within the province, and should invite and encourage Indian capitalists by information and technical assistance to organise them. It was the adoption of such a course that enabled Germany and Japan to achieve rapid industrial development. Sir Frederick Nicholson urged the adoption of this course on us in the following passage in his note :—

" On the whole, then, I consider that the best way both for starting selected industries in India and for training the future managers is, after the fashion of Germany and Japan and other countries, for the promoters, whether Government or private, to draw liberally on Great Britain, etc., for real experts as first managers of any projected industries; then to select young men, preferably men already trained in technological institutions, and to put them through close disciplined, industrial and business training under these experts till they are fitted either to start on their own account or as reliable business managers to capitalists."—(Minutes of Evidence, Vol. III, pages 396-397.)

Mr. Charles Tower also says :—

" In the manufacture of steel ware and of machinery, Germany is usually credited, not without justice, with being rather an imitator than an initiator. Her great success in this line has been achieved by the rapidity with which Germany had adopted the improvements invented elsewhere."—(*Germany of to-day*, Home University Library, page 173.)

This is also the course which was adopted by America. Up to 1860 America had made little progress in developing the manufacture of steel. In 1862 Park Brothers and Company imported the biggest crucible steel plant of all up to that time, and imported also several hundred English workmen to ensure success. Since then the progress of the steel industry there has been phenomenal. In 1860 the output of pig iron in the States was only 0·8 million tons, and of steel nil ; by 1900 America was producing 13·7 millions of tons of pig iron and 10·1 of steel, and in 1913

while the production of pig iron amounted to 10·3 million tons in the United Kingdom, it amounted to 31 million tons in the United States. Last but not least, we have an eloquent illustration in India itself of the soundness of this policy in the success of the Tata Iron and Steel Works. The works were organised with the advice, and have been carried on under the supervision of the best experts imported from abroad, and they have been a conspicuous success. This, therefore, is the right policy which should be followed in regard to the many other industries the need for which has been pointed out in our chapter on the industrial deficiencies of India. Raw materials and labour abound, capital exists and only wants organising, the home market is extensive, the machinery and the expert can be imported, the profits to the Government and the people will be considerable; all that is needed is that the Government should whole-heartedly lead and assist Indian capital in organising the industries.

But to carry out industrial development in this wise it is essential, as Mr. H. P. Gibbs, the General Manager of the Tata Hydro-Electric Supply Company, so well put it in his written evidence before us, that—

> "no man should be imported into India unless he is a recognised expert in his particular line. He too should be engaged on short-time contract and made to understand he is being engaged and paid to teach our local men just as much as to introduce and carry on his work. The young man from abroad who is educated but inexperienced should not be brought to India and allowed to get his practice here."

The industries which will be so started will be the best practical schools for training our science graduates as recruits for the proposed imperial services.

Provision for Scientific Research.

The second class of industries consists of those for which some research work is needed. I fully agree with my colleagues about the need and value of such research. I recognise that, to borrow the language of the Committee of the Privy Council, "effective research, particularly in its industrial applications, calls increasingly for the support and impetus that come from the systematised delving of a corps of sappers working intelligently, but under orders." I am therefore not opposed to the idea of creating an Indian Chemical Service and an Imperial Industrial Service at the right time and under the right conditions. But I regret I do not agree with my colleagues as to the time when, and the conditions under which, these services should be organised. In my opinion our first duty is to create the material for these services in this country. One important means of doing this is the starting of industries, as I have urged above, under imported experts and placing our select young men, already trained in technological institutions, under them. The other measures which in my opinion are needed are:—

(*i*) that steps should be immediately taken for developing the teaching of science and technology in our existing Universities and other collegiate institutions, (*a*) by strengthening their staff and equipment, and (*b*) by awarding a sufficiently

large number of scholarships to encourage the study of science and technology at our schools, our colleges and our Universities ;

(*ii*) that an Imperial Polytechnic Institute, manned by the most distinguished scientists and engineers, whose co-operation we can secure, should be established in the country, for imparting the highest instruction and training in science and technology ; and

(*iii*) that the provision of scholarships for study in foreign countries should be largely increased to enable the most distinguished of our graduates to finish their education in the best of foreign institutions.

The view which I humbly urge here is strongly supported by the recommendations made in the "Interim Report of the Consultative Committee on Scholarships for Higher Education," of which the Right Hon'ble Mr. A. H. Dyke Acland was the Chairman. The Committee was appointed before the war in March 1913. The report from which I am going to quote was adopted by it in May 1916. In a prefatory note to the Report, Sir Amherst Selby-Bigge, writing on behalf of the Board of Education, said :—

"The Board have no need to use complimentary phrases to convey their estimation of the great value of their work, but on this occasion they may perhaps permit themselves to express their appreciation of the broad spirit in which the report is conceived, of its forcible exposition of principles, and of the lucid and vigorous style in which it is written."

The recommendations are of such great weight and have such a direct bearing on the question I am dealing with, that I make no apology for reproducing them here :—

"On the side of science and technology in relation to the industries and commerce of the nation, the greatest needs of the nation are ranged by us in order of practical priority as follows, though their satisfaction should proceed as far as possible contemporaneously and concurrently.

"(129) The first need is the wider recognition, especially by employers, of the benefit that can be obtained by the employment in industry, agriculture, and commerce, of men trained in science—in all grades, but specially for directive and advisory posts. A great improvement is already seen; but public opinion needs further enlightenment.

"(130) Secondly, the most useful thing that can be done without any increase in the means at present at our disposal is to encourage research in existing institutions after graduation. There were probably before the war more men and women fitted to be trained in research than were secured for this public service. The prolongation of scholarships in suitable cases, which we recommend, is one means that is available; other means fall within the province of the Committee of the Privy Council.

"(131) Given a limited amount of money available annually the next need would be to assist existing institutions for training in science and technology, to enable them to improve their equipment, increase their staff, attract more highly qualified teachers, and introduce new subjects of study; and to establish new places of higher technical and scientific instruction where needed. To bring existing institutions fully up to national needs a great capital sum and income would be required. But any sum well expended, would be useful. However, in view of the needs of the nation and the empire, it seems probable that the larger sum will be forthcoming, at whatever sacrifices in the immediate future.

"(132) Improved and extended higher secondary education is needed. Side by side with this, with the strengthening of Universities and technical schools, and with

an incrasing demand for scientific workers, an increase in the supply of scholarships from secondary schools and Universities will be required. This should move forward *pari passu* with other improvements."—(Pages 69-70.)

This view also receives support from the conclusions at which the Committee of the Privy Council for Scientific and Industrial Research arrived. In their Report for the year 1915-16 (pages 40 and 41), they summarised those conclusions as follows :—

" If we were asked to state these conditions (that appear to us necessary for the success of our work) in the shortest possible terms we should reply : First, a largely increased supply of competent researchers ; secondly, a hearty spirit of co-operation among all concerned, men of science, men of business, working men, professional and scientific societies, Universities and technical colleges, Local Authorities and Government Departments. And neither condition will be effective without the other.

" Before the war the output of the Universities was altogether insufficient to meet even a moderate expansion in the demand for research. The annual number of students graduating with First and Second Class Honours in science and technology (including mathematics) in the Universities of England and Wales before the war was only about 530, *and of these but a small proportion will have received any serious training in research.* We have frequently found on inquiry that the number of workers of any scientific standing on a given subject of industrial importance is very limited.

" The responsibility for dealing with the grave situation which we anticipate, rests with the education departments of United Kingdom. We shall be able to do something to encourage a longer period of training by the offer of research studentships and the like ; but that will not suffice. It is useless to offer scholarships if competent candidates are not forthcoming, and they cannot be forthcoming in sufficient numbers until a larger number of well educated students enter the Universities. That is the problem which the education departments have to solve, and on the solution of which the success of the present movement in our opinion largely depends."

Recruitment of the Scientific Services.

For the recruitment of the scientific services, the Indian Chemical Service, and others, my colleagues recommend that " to the utmost extent possible the junior appointments should be made from science graduates of the Indian Universities, and that the senior and experienced men who will be required to initiate and direct research work should be obtained on special terms from England, *when such are not available here.*" The qualifying clause which I have emphasised must be appreciated at its practical value. My colleagues recognise that a " relatively small field of selection at present exists in India." They say :—

" As development of science teaching at the Universities proceeds, and opportunities for technical training in India increase, we believe that the necessity for importing specialists will greatly diminish, and that ultimately the services will be mainly filled with officers trained in this country."

But they say further on that " it will be some years before it will be possible to obtain the full necessary staff in India."

They therefore rely for such recruitment mainly on England. But they recognise that—

" there will be similar post-war demands made at home and in the dominions for scientific, especially chemical, experts, which will render is difficult to obtain suitable recruits from England. It is probable, consequently, that salaries higher than the pre-war rates will be demanded by suitably qualified experts."

But I think that qualified English experts will not be available at any rate in any number for some years even for higher salaries than

those of the pre-war period. The Committee of the Privy Council said in their Report for 1915-16 :—

"It is in our view certain that the number of trained research workers who will be available at the end of the war will not suffice for the demand that we hope will then exist. We are too apt to forget in this country that with industry as with war, a brilliant group of field officers, and even a well-organised general staff, need armies of well-trained men in order to produce satisfactory results."

In view of these facts, it will be wise of us not to rely upon our being able to indent on England for the "senior and experienced men who will be required to initiate and direct research work in India." Besides, though they advocated that "senior and experienced men" should be obtained from England, what my colleagues have actually proposed is very different from it. They have proposed that "recruits for these services—especially chemical services—should be obtained at as early an age as possible, preferably not exceeding 25 years." They leave no room for doubt as to what they mean. They say :—

"We should thus secure the University graduate, who had down one or perhaps two years' post-graduate work, whether scientific or practical, but would not yet be confirmed in specialisation. We assume that the requisite degree of specialisation will be secured by adopting a system whereby study leave will be granted at some suitable time after three years' service, when a scientific officer should have developed a distinct bent."

In their recommendations regarding the recruitment of the Imperial Industrial Service also, they say that "the age of recruitment should not usually exceed 25 years," and that they think it desirable, "if the young engineers whom we propose to recruit are to develope into valuable men, that they should be encouraged after about three years' service to take study leave." It is obvious then that under the scheme proposed by my colleagues the men to be recruited from England will not be "senior and experienced men" but raw graduates from Universities who will be expected to specialise after joining the service in India. Specialisation almost always involves delay. If therefore we must take in only raw graduates and remunerate them during the years they are qualifying themselves for effective research work, I think it is very desirable that we should take in Indian graduates whose training will be less costly, and who will serve the country throughout life, whereas in the case of an English graduate, there will always be the apprehension that he may leave us for higher emoluments elsewhere, and the certainty that he will leave the country after the period necessary to qualify for a pension, taking away with him the knowledge and experience which he had gained in its service. Having regard to all the considerations which have been urged above, I think the idea of recruiting this service from England should be abandoned, and that it should be decided that it shall be recruited entirely from among graduates of the Indian Universities and of the Imperial Polytechnic Institute, which I have recommended.

My recommendation has the further merit of being entirely in consonance with the recommendations made by the Royal Commission on the Public Services in India regarding the recruitment of scientific and

technical services. Indians have a very sore feeling about the imperial Indian services. The importation of experts from England for these services has not only unnecessarily increased the cost of these services to India but has had the very great disadvantage of preventing Indians from being trained for higher work in these services. We can never forget that so distinguished an Indian as Dr. P. C. Roy did not find admission into the Indian Educational Service. We know that though the Geological Survey of India has been in existence for 64 years, up to 1913 only three Indians had been appointed to the superior service in it. In this connection I put the following question to Dr. H. H. Hayden, Director of the Geological Survey of India :—

"Has the department kept it as an object before it that it should train Indians to qualify themselves for employment in the higher grades of the department ?"

And his answer was :—

"We have been for many years training men in the subordinate ranks of the department, but they do not necessarily qualify for appointments in the higher grade. It is always open to them to apply for an appointment in that grade . . . "

My Hon'ble colleague Mr. Low then asked Dr. Hayden :—

"You have these research scholars. Is it not one of the objects of research scholarships, that the scholars, if possible, should qualify themselves for recruitment to the department ?"

And the answer was :—

"That is one of the objects of the efforts we have made in educating them in geology in the Presidency College and the Calcutta University. I think geological education was initiated in Calcutta by the Geological Survey. We have had more Indians in the subordinate branch of the service."

The Indian witnesses before the Royal Commission quoted the opinion of Dr. Oldham, the first head of the Geological Department, concerning the fitness of Indians for this department, which showed that he had "the most unshaken confidence that with even fair opportunities of acquiring such knowledge (that of the physical sciences) many Indians would be found quite competent to take their place side by side with European assistants either on this survey or in many other ways," and yet the evidence before the Royal Commission showed that competent Indians had found the door of admission barred against them and that up to 1913, only three Indians had been appointed to the superior service.

My colleagues say that the ultimate object should be to man the services they propose with officers trained in this country. Similar language was used in the past in relation to other imperial departments. For instance, it appears that in the Agricultural Department the intention of the Government of India from the very commencement was that it should be staffed largely by Indians.

"We adhere firmly," wrote the Government of India to the Secretary of State in 1910, "to our frequently declared policy that the service (the Agricultural service) should be manned ultimately by Indians and that the object to be kept steadily in view is to reduce to a minimum the number of experts appointed from England and to train up indigenous talent so as to enable the country to depend on its own resources for the recruitment of its agricultural staff in the higher branches."

But in spite of this clear declaration, the Imperial Service has become the monopoly of Europeans, while Indians have been confined to the Provincial Service. The evidence of Dr. Harold Mann and of the representative members of the Provincial Service before the Royal Commission showed that many highly qualified Indians, several of whom possessed European degrees or experience, had been unable to find admission into the Imperial Service, which had been manned by recruits imported from Europe, who, said Dr. Mann, laboured under the serious disadvantage that their experience related to a system of agriculture, " which in its organization is quite foreign to most parts of India and will be for a long time to come."

So also with regard to the Imperial Forest Service. The Inspector General of Forests stated in his evidence before the Royal Commission that

" . . . when the Forest Department was instituted, and for a long time afterwards, both the Government of India and the Secretary of State expressed the opinion that it was a special department in which the service of Indians should be utilised as largely as possible."

Yet from 1891 to 1906 no steps were taken to provide for direct recruitment to the Provincial Service, and it was laid down in 1912 that candidates for the Imperial Forest Service " must have obtained a degree with honours in some branch of natural science in a University of England, Wales or Ireland, or the B.Sc. degree in pure science in one of the Universities of Scotland." At the time the Royal Commission took evidence, the total number of officers in the superior service in the Agricultural, Civil Veterinary, Forest, Geological Survey, Locomotive and Carriage and Wagon Departments was 407. Of these only six officers were statutory natives of India !

The Royal Commission recognised the injustice that had been done to Indians in their practical exclusion from the scientific and technical services. They expressed the opinion that there were no political grounds whatsoever for recruiting the superior staff of such services in Europe. They stated that if the requisite technical training were available in India, the necessity for indenting on Europe for qualified men would cease to exist, and they therefore recommended that " a determined and immediate effort " should be made to bring about conditions which would soon make it possible to meet the normal requirements of the services without requisitioning the services of men from abroad. That effort remains yet to be made ; and while my colleagues have proposed the creation of two more imperial services they have recommended that the establishment of the Central Chemical Research Institute and of the Imperial Engineering College may wait for an indefinite future. These facts, coupled with the experience of the past, make me apprehend that, if these two services are created on the lines suggested by my colleagues, the senior appointments in them also will for a long time remain practically the monopoly of Europeans, and that Indians will not only be kept out of their emoluments, but also of the opportunities for acquiring high efficiency in the subjects with which the services will be concerned. The Royal Commis-

sion recommended that with a view to bring about the conditions which would soon make it possible to meet the normal requirements of the services without requisitioning the services of men from outside, existing institutions should be developed or new ones created and brought up to the level of the best European institutions of a similar character. They recognised "that this would require an initial expenditure of a considerable sum of money," but they urged that "the outlay would be more than repaid, not only by the additional facilities which such institutions would give to young men to qualify themselves for direct appointment, to the higher branches of the public services, but by the contribution they would make to the industrial progress of the country." These recommendations lend strong support to my proposal that a first-class Polytechnic Institute should be established in India as one of the first measures needed for the industrial development of the country. At such an institute provision should be made for imparting the highest instruction and training in all the important branches of science and technology, and also in commerce and administration. This will be the best means of creating the army of trained workers which is needed for promoting industrial development in this extensive empire. The institution of the proposed services should wait until this has been done. And in the meantime only such appointments should be made in the Departments of Industries as it is absolutely necessary to fill.

The Estimate of Cost.

The proposals which we have made in the Report show that the number of technically trained men who will be needed to carry on industrial development and to promote the trade and commerce of the country, will be a very large one, and that it will grow steadily for some time. It is also certain that public expenditure will rise in several directions after the war. These considerations demand that expenditure should not be raised in any department beyond what is actually necessary. The salaries which my colleagues have proposed for the Imperial Industrial and the Indian Chemical Services are largely based upon a consideration of what is likely to attract Englishmen to the senior appointments in the services. If, in view of all that I have urged above, the decision should be arrived at that these services should be manned by Indians, including in that term those Europeans who are statutory natives of India, the proposed expenditure would be largely reduced. This is no mean consideration and should not be ignored. Situated as India is, one cannot too often recall the wise remarks of Sir William Hunter, made many years ago, that—

"if we are to give a really efficient administration to India, many services must be paid for at lower rates even than at present. For those rates are regulated in the higher branches of the administration by the cost of officers brought from England. You cannot work with imported labour as cheaply as you can with native labour and I regard the more extended employment of the natives, not only as an act of justice but as a financial necessity . . . If we are to govern the Indian people efficiently and cheaply, we must govern them by means of themselves, and pay for the administration at the market rates for native labour."

Should this view be accepted, the salaries proposed would be reduced by about 30 to 40 per cent.

I do not attempt to make any detailed alternative proposals regarding the cost of the scheme. If any of my suggestions commend themselves to Government, the details will easily be worked out.

Speaking generally, I would say that a substantial part of the expenditure that is proposed for salaries should be saved, partly by reducing the number of appointments proposed and partly by fixing the salaries at the standard which will be suitable for Indian graduates and scholars. The expenditure proposed on buildings will also, in my opinion, admit of a very substantial reduction. Here again the example of Japan affords us guidance. They spend very much less on their educational buildings than is spent in India. A scheme for the award of scholarships to encourage the study of science and technology can be best prepared by the Education Department.

As regards grants to Universities, I would recommend that on an average an annual grant of a lakh and a half should be made to each University for the purposes of providing instruction and teaching in science and technology, particularly in mechanical and electrical engineering, applied chemistry, commerce and agriculture. A capital grant of about 15 lakhs each should be made for the necessary educational buildings and residential quarters and for equipment. And lastly, I would recommend that, to start with, a capital expenditure of 30 lakhs, and an annual grant of six lakhs a year should be sanctioned for an Imperial Polytechnic Institute.

Conclusion.

I cannot conclude this note better than by endorsing the following generous and wise words of Sir Frederick Nicholson :—

"I beg to record my opinion that in the matter of Indian industries we are bound to consider Indian interests firstly, secondly and thirdly.—I mean by 'firstly' that the local raw products should be utilised, by 'secondly' that industries should be introduced, and by 'thirdly' that the profits of such industry should remain in the country."

If measures for the industrial development of India are taken in this spirit, India will become prosperous and strong, and England more prosperous and stronger.

MADAN MOHAN MALAVIYA.

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Conclusion.

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